

HEALTH LOCUS OF CONTROL AND DEFENSIVE BIAS

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CHAPTER 1

I. INTRODUCTION

Background

Lifestyle related health problems, such as cardiovascular disease and cancer, are the leading causes of death in contemporary American society. Nevertheless, many of the most fatal afflictions can be prevented by changing health related behaviors, such as diet and physical inactivity (Center for Disease Control (CDC), 2005). Media campaigns and physicians facilitate preventative health behaviors by communicating information and messages. Often these campaigns are designed to induce high levels of negative affect in order to increase the significance and accessibility of the message (Hill, Chapman, & Donovan, 1998; Sutton, 1992). However, research has shown that when individuals receive personally relevant information such as a threatening health message, they show a greater tendency to be critical than if the message contained favorable information. This phenomenon is referred to in the social psychology literature as *defensive bias* (Ditto, Croyle, & Croyle, 1995; Jemmott, Ditto, & Croyle, 1986; Kunda, 1987).

The Problem

Defensive processing of a threatening health message may allow an individual to minimize the perceived associations between one's behaviors and negative outcomes implied in the message. Biased evaluations of new and

important health information may have a negative effect in the long run. Individuals for whom health messages are intended may be the least likely to accept them. For this reason, it is important to identify certain characteristics of people who are more likely to defensively process relevant health messages in order to make health messages more meaningful and salient. If characteristics are identified that contribute to defensive processing, the content of threatening health messages can be adapted to minimize defensive processing and promote adaptive behavior. To date, the only mediating factors of defensive bias that have been investigated are message relevance and perceived prevalence and curability of the disease.

Research has shown that message relevance plays an important role in whether or not people are likely to engage in defensive processing after hearing a health message. People are more likely to scrutinize a health message for fault when it is incongruent with their own health behaviors (Kunda, 1987). Furthermore, regardless of how threatening the message is (high or low threat), individuals are likely to show defensive systematic processing of the information (Liberman & Chaiken, 1992). Perceived prevalence and curability of a disease has also been shown to impact defensive processing of a threatening health message; the more rare and dangerous the disease is perceived to be, the more apt people are to engage in defensive processing of the message (Ditto, Jemmott, & Darley, 1988; Jemmott et al., 1986; Kunda, 1987).

Another potential differentiating factor that could influence defensive processing of threatening information is an individual's perceived control over behaviors and risk factors that lead to negative health conditions. If a negative event is perceived as controllable by personal actions, a person will be more likely to display defensive bias

when confronted with messages that are incongruent with current behaviors. People who believe that a threatening health condition can be avoided by personal actions may be more likely to engage in defensive processing in order to prevent a blow to self-image. In questioning or doubting the threatening information, the individual may fail to change risky behaviors that put one at risk. Identifying client's perceived control over health events may help physicians to present negative health diagnoses in a way that would minimize the immediate defensive reaction.

The degree of control over health that individuals perceive to have is referred to as "locus of control." This area of research has its roots in Rotter's (1954) social learning theory, which focuses on expectancy beliefs in promoting behavior in specific situations. Wallston and Wallston (1978) developed the multidimensional locus of control scale (MHLC) in order to examine locus of control in the prediction of health behavior. Research has shown that when individuals receive information consistent with their health locus of control beliefs (HLC), they are more likely to act on the information (Quadrel & Lau, 1989; Williams-Piehota, Schneider, Pizarro, Mowad, & Salovey, 2004). What is unclear, however, is whether or not receiving high and low threat messages consistent with HLC beliefs will reduce defensive bias.

The Purpose

The purpose of this study was to determine if presenting high and low threat messages regarding an unfamiliar fictitious disorder would affect defensive processing in a college student population, similar to the studies mentioned above, using an internet-based approach. In today's technological era, psychological research conducted on the internet is increasing, and it is important to establish that internet-based approximations

are comparable to lab protocols, and not to assume that data obtained parallels that collected in a laboratory setting (Birnbaum, 2004; Reips, 2002). By replicating the methods used by Kunda (1987), this study determined if an internet-based protocol yields similar results as conducting the study in the lab. It was predicted that when threatening health messages about the disease are presented, defensive processing in individuals for whom the message is highly relevant (high caffeine consumers) would occur significantly less than in individuals for whom the message is irrelevant.

Another purpose of this study was to determine if internal or external HLC is related to processing of threatening health messages. If HLC is related, media campaigns and physician advice could be changed to have more of an impact on patient preventative health behaviors. Health messages presented in terms of individual HLC may be more effective in decreasing the tendency to engage in defensive processing and initiating health change behaviors. However, research must first establish that HLC is related to the tendency to engage in defensive processing when confronted with threatening health messages. It was hypothesized that individuals with high internal HLC beliefs would be more likely to engage in defensive processing than individuals with high external HLC beliefs when confronted with a threatening health message.

CHAPTER II

II. LITERATURE REVIEW

This review will begin with a focus on health-related attitudes and behaviors and the impact of relevant health messages. Then the review will describe the literature related to defensive bias in response to threatening health information, as well as strengths and weaknesses of cited studies. Finally, research related to health locus of control will be described.

Health Behavior and Health Messages

Lifestyle related health problems, such as cardiovascular disease and cancer, are the leading causes of death in contemporary American society. For example, about 61 million Americans, or about one-fourth of the population, have a form of cardiovascular disease. Nevertheless, many of the most fatal afflictions can be reduced by changing health-related behaviors, such as diet and physical activity (CDC, 2005).

Media campaigns and physicians help facilitate these preventative health behaviors by communicating information and messages about health. According to the CDC (2005), years of research show that encouraging healthier lifestyles and increasing early detection can prevent disease and improve the health of people who have experienced these common conditions. These campaigns are sometimes designed to induce high levels of negative affect in order to increase the impact and accessibility of the message (Hill et al., 1998; Sutton, 1992). According to a review by Leventhal (1970), viewing a threatening health message leads to an emotional reaction as the listener

considers the harmful consequences of engaging in a behavior. Theoretically, complying with the behavior change implied by the message (e.g., quitting smoking) would reduce the negative affect that resulted from the message, and thus the purpose of the message would be fulfilled. However, the message does not always have the intended effect on individuals' health-related behaviors, as evidenced by the rates of cardiovascular disease and smoking in American society (CDC, 2005).

Effects of the message may be moderated by other factors such as acceptance of the message, as related to preconceived attitudes, intentions, and perceived control over changing the behavior. This is in line with Ajzen's Theory of Planned Behavior (TPB) (1991), which shows that intentions to perform a behavior can be predicted with significant accuracy from looking at an individual's attitude towards the behavior, perceived social pressure to engage in the behavior, and perceived control over changing. Intentions to adopt healthier lifestyles account for substantial variance in performing actual behaviors, meaning that the more an individual intends to change a behavior, the more likely a behavior change is to occur. Intentions to engage or not engage in a behavior can be effected by outside sources such as media campaigns and advice from family, friends, and physicians.

Overall, research has shown that when individuals receive self-relevant information such as a threatening health message, they show a greater tendency to be critical than if the message contains favorable information. As described by the literature in social psychological research, a consistently reported finding is the tendency of individuals to perceive information that is consistent with individual preference, opinion, or behavior as more valid than inconsistent information (Ditto & Lopez, 1992; Liberman

& Chaiken, 1992; Kunda, 1987). When information is presented to an individual that is inconsistent with current preferences, opinions, or behaviors, the individual is more likely to question this information and/or apply it in a way that is more self-serving. This phenomenon has been referred to with a variety of different names, such as motivated inference, motivated skepticism, motivated reasoning, self-serving biases, etc, but for the purposes of this review, this phenomenon will be referred to as defensive processing or defensive bias.

Defensive Bias

A review by Ditto and Lopez (1992) illustrates the prevalence of defensive processing, whether the information concerns one's intelligence (Wyer & Frey, 1983), social sensitivity (Pyszczynski, Greenberg, & Holt, 1985), or performance in school (Kunda, 1987). One possible reason for perceiving preferred information as more valid than preference inconsistent feedback, as suggested by Kruglanski (1980,1990), is that individuals feel inclined to engage in an extensive search for alternative explanations when negative information received is inconsistent with the desired conclusion or past assumptions. This information search is motivated by a desire to maintain a positive self-image, such as the need to feel rational, reasonable, informed, etc. When information received is consistent with past assumptions, an individual does not need to generate alternative hypotheses; the congruent information is processed without question.

Pyszczynski and Greenberg's (1987) model of motivated inference draws similar parallels to Kruglanski's report. They argue that individuals make attributions for life events, and these attributions have affective, cognitive, and motivational aspects. Attributions that help the individual achieve a goal, such as positive self-image, create

positive affect or minimize negative affect; attributions that obstruct the individual from achieving the goal create aversive states of arousal. When making attributions for life events that are consistent with expectancies, individuals tend to rely on “preexisting causal theories” to make the attribution. On the other hand, when unexpected events occur, the individual engages in “active hypothesis testing.” In other words, when an individual is confronted with information that holds unfavorable consequences for the self, they are more likely to conduct a mental search of alternative options, generate multiple hypotheses for or against the incongruent feedback, and devote more energy in processing the information than when the information received is more congruent with previous notions. As a result, the individual may display a defensive response to the new incongruent information in an attempt to search for information that is more congruent with preexisting causal theory.

Ditto and Lopez (1992, studies 2 and 3) examined the above hypothesis that information congruent with previous beliefs is processed relatively quickly while non-congruent information involves cognitive analysis at a deeper level. In these studies, college students were brought into the lab and told about a fictitious enzyme disorder. The participants were told that lacking a specific enzyme was a risk factor for a number of pancreatic disorders, and that a test could determine whether or not the enzyme deficiency was present. After being tested, participants were given phony feedback about being tested positive or negative for the deficiency. Study two showed that participants in the deficiency condition spent more time accepting and thinking about the unhealthy diagnosis than those in the deficiency-lacking condition. Study three showed that individuals in the healthy condition generated less alternative explanations for the

enzyme test result than the individuals in the unhealthy condition. These results are consistent with the predictions proposed by Kruglanski (1980, 1990) and Psyczynski et al. (1987), in that individuals spent more time engaging in an extensive search for alternative explanations, or “active hypothesis testing,” after receiving information that is inconsistent with past assumptions of being healthy.

In summary, research has demonstrated that individuals show a defensive response to information that is inconsistent with personal preference by engaging in a mental search for alternative options. As described by Kruglanski (1980, 1990) and Psyczynski et al. (1987), defensive processing of preference inconsistent information occurs in order to relieve aversive states of arousal and maintain positive self-image. Individuals frequently engage in extensive processing as a face-saving behavior to bridge that gap between previous beliefs and the introduction of new, competing information. The reaction to this new information, in turn, is a defensive response.

One example of a defensive response may be to control the information upon which attributions are based, as shown by Lord, Ross, and Leppler (1979). In their study, participants supporting and opposing capital punishment were exposed to two studies, one confirming and the other disconfirming existing beliefs. As predicted, the participants rated the study that confirmed their own beliefs as more convincing than the disconfirming study. Even though participants were presented information that was incongruent with previously held beliefs, they chose to control for this information by becoming more polarized to the previously held beliefs. When asked for final attitudes regarding the study, proponents reported being even more in favor of capital punishment, while opponents reported being more strongly against the death penalty. The authors

concluded that the bias is motivated by a desire to protect self-worth, and to acknowledge the validity of the views of the other side would presumably threaten one's self-image as an informed person.

In addition to responding defensively to messages disconfirming previously held beliefs and values, individuals also respond to health messages with threatening content in a defensive manner. When presented with a message that is incongruent with a health behavior (e.g., an anti-smoking ad viewed by a person who smokes), individuals often employ a range of defensive behaviors to protect self-image, including discounting the importance of the threat, coming up with different ways to interpret the information, and attacking the credibility of the threatening information (Croyle and Sande, 1988; Ditto et al., 1988; Ditto et al., 1992; Jemmott et al., 1986; Kunda, 1987; Leffingwell, Neumann, Babitzke, & Bozcar, in press; Liberman and Chaiken, 1992). In turn, this defensively biased interpretation of relevant health information can prevent adaptive changes in health behavior.

Kunda (1987)(study three) illustrates the natural tendency of people to respond defensively to threatening health messages. This study showed that people are more likely to scrutinize a health message for fault when it is incongruent with their own health behaviors than people for whom the message is not personally relevant. Heavy and low caffeine drinkers were provided information linking caffeine intake to fibrocystic disease, which is related to breast cancer. This disease was used in the experiment because it is relatively unfamiliar to most people. Furthermore, current research has cast doubt on the supposed link between the disease and breast cancer; now it is believed to be a result of ovarian hormones. It was hypothesized that heavy caffeine drinkers would be less willing

to believe the article on the disease than the people who did not consume much caffeine, because the former would be personally threatened if the disease evidence were true.

After presenting this information to heavy and low caffeine drinkers, results indicated that heavy caffeine drinking women were more skeptical of the evidence than low caffeine drinkers. Men, who were obviously less threatened by the disease threat than women, were significantly less likely to doubt the validity of the article. High caffeine consuming women were most likely to question the legitimacy of the report. It seems that the participants who were more apt to suffer personal repercussions if the evidence were true were more likely to implement a face saving strategy by doubting its truth.

However, Kunda (1987) offered an alternative explanation for these results. It is possible that female heavy caffeine consumers might have held different beliefs about the effects of caffeine prior to the study than male heavy caffeine consumers, and these beliefs influenced the processing of the message. In the previous study, the motivation to hold on to an optimistic view regarding future health was high enough that participants were inclined to be skeptical of the article. In engaging in defensive processing, participants were accessing “inferential rules and background beliefs” that would allow them to reduce the believability of the message. Study four was designed to rule out this potential interpretation of results (Kunda, 1987). This study was identical to study three except the participants were told that the disease was present in 65% of women. The motivational pressure to disbelieve the article was reduced by making the disease appear more ordinary; the article stated that the disease was so common that doctors felt that it shouldn't even be considered as a disease. Since the disease was so common, women were led to believe that the health effects were not as negative or life-threatening.

Perceived prevalence was shown to effect defensive processing; when motivational pressure to disbelieve the evidence was reduced, high caffeine consuming women were less likely to doubt the information. Taken together, these studies suggest that people engage in biased processing of relevant negative health information, but only when the motivation to do so is high, like when the disease is considered rare and dangerous. As reported by Kunda (1987), “the reluctance of female heavy caffeine consumers to be convinced by the threatening evidence is probably due to motivational processes designed to preserve optimism about their future health rather than to different prior beliefs about the effects of caffeine” (p. 644).

One criticism of the paradigm described by Kunda (1987) is that the study failed to assess the mediating processes of the defensive response. Liberman and Chaiken (1992) conducted a study to assess whether individuals in a highly relevant condition processed high threat and low threat messages the same way. They used the same unfamiliar topic described by Kunda (1987), the link between fibrocystic disease and breast cancer. This study included heavy coffee drinkers and non-drinkers, and matched participants to conditions according to prior assessment of personal relevance and prior beliefs about coffee (since coffee drinkers were shown to have more negative beliefs about caffeine than non-drinkers). The participants were exposed to either a high threat message or a low threat message; in each condition the message included evidence to support and refute the claim but in the high threat condition the message concluded that the alleged health threat had been confirmed and in the low threat condition the message concluded that it had been disproved.

As hypothesized, participants for whom the message was highly relevant (heavy coffee drinkers) were significantly less critical of the parts of the message that refuted the claim but more critical of the parts that supported the claim. High-relevance participants listed more weaknesses in the pro-link report than the anti-link report. Interestingly, this result held true for the high-relevance participants across both the low and high message threat conditions. It appears that, when presented with relevant health messages (regardless of how threatening the message is), individuals are likely to show defensive systematic processing of threatening information by questioning threatening information more than encouraging information.

In summary, the aforementioned studies show individuals tend to engage in defensive processing when the motivation to do so is high (in the case of a rare and serious disease), controlling for prior beliefs about the threatening health message (Kunda, 1987). In addition, the applicability of threatening health messages has been shown to effect defensive responding; regardless of how threatening the message is, participants for whom the message is potentially relevant show equal amounts of defensive processing (Liberman & Chaiken, 1992). It seems that message relevance is one of the mediating processes of defensive response to threatening health information.

Research has continued to identify other potential mediating processes of the defensive response, such as perceived prevalence of a disease. Jemmott et al. (1986) conducted a series of experiments to better understand how individuals respond to threatening health information when disease prevalence is taken into account. In the first of the series of studies college students were brought into the lab and told about a fictitious enzyme disorder. The participants were told that lacking a specific enzyme was

a risk factor for a number of pancreatic disorders, and that a test could determine whether or not the enzyme deficiency was present. After being tested, participants were given phony feedback about being tested positive or negative for the deficiency. Researchers also manipulated the prevalence of the deficiency; one group of participants was told the disease was more prevalent (80% of participants in the condition had the deficiency) than the other group (20% had the deficiency).

Results showed that participants who were told that they tested positive for the deficiency were more likely to believe the disorder was less serious or the test was inaccurate than the participants who were told they did not have the deficiency. Perceived prevalence also had an impact on supposed importance of the disorder; participants in the high prevalence condition were more likely to believe the disorder was less serious than participants in the low prevalence condition. The defensiveness explanation was further supported by the fact that the tendency to deny or question the credibility of the test was most pronounced in the condition where the participants should have shown the most anxiety about the results: the individuals in the deficiency-present, low prevalence group.

One possible explanation of the findings by Jemmott et al. (1986) is that because participants were not experiencing any symptoms from the disorder, they may have minimized the seriousness of the disorder. Croyle and Sanda (1988) replicated the study by Jemmott et al. (1986) and included a symptom checklist given to participants after receiving the diagnosis. Participants who were told that they lacked the enzyme were more likely to recall symptoms consistent with the disease, suggesting that defensive processing is not due to lack of knowledge about symptom presence.

As shown above, the less prevalent a disease is considered to be, the more likely an individual is to engage in defensive processing and deny the seriousness of the disorder. However, if the disease is described as “treatable,” is the pressure to engage in defensive processing less pronounced than if the disease was described as “incurable?” Ditto and colleagues (1988) used the enzyme deficiency paradigm to examine the relationship between threat appraisal and curability of the disease. Half of the participants were told that the disease was treatable and half were told the disease had no known treatment. Researchers found that treatment-informed enzyme deficiency participants and no-deficiency participants rated the disorder as more serious than deficiency patients who believed the disease was incurable. In addition, participants who were told the disease was untreatable were more likely to rate the disease as less serious. The authors concluded that participants who believed the disease to be incurable would be more motivated to engage in defensive processing and deny the seriousness of the disease, especially participants who were led to believe that they had the enzyme deficiency.

One limitation to the research discussed above is that most of the studies typically employed information about a fictitious disorder, which was unfamiliar to the participants. It is possible that individuals respond differently to information addressing the threat of familiar diseases. Croyle, Sun, and Louie (1993) examined this idea by providing cholesterol screening tests to participants in positive and negative feedback conditions. Participants who received at-risk cholesterol feedback were more likely to rate high cholesterol as a less serious threat to health than those who had cholesterol levels in the healthy range, showing that defensive bias is a common initial response to

high cholesterol screening results. It seems that individuals respond similarly to information about familiar disorders as they do fictitious disorders.

In addition to responding similarly to information about familiar disorders as fictitious disorders, individuals also show defensive bias after receiving information about risky behaviors, such as alcohol use. Leffingwell et al. (2003) found that alcohol-using college students were more likely to be skeptical of articles reporting on college alcohol use than non-using students. In addition, students who used alcohol were more likely to perceive college drinking as less of a problem than non-users.

In summary, the aforementioned studies are illustrative of the natural tendency of people to respond defensively to threatening health messages. In the case of health behaviors, the natural tendency employed to discount the significance of a threatening health message may be face saving in that the discrepancy between one's behaviors and reported negative outcomes can be minimized or resolved. However, allowing beliefs about current health behaviors to bias evaluation of new and important health information may have a negative effect in the long run, such as discounting a message about cancer caused by cigarette smoking. This defensively biased interpretation of relevant health messages can prevent adaptive changes in health behavior. Thus, individuals for whom health care messages are geared towards may be the least likely to accept them. For this reason, it is important to identify ways to make health messages more meaningful and salient and reduce the tendency to engage in defensive processing.

According to self-affirmation theory (Aronson, Cohen, & Nail, 1999), the key to reducing defensive processing is to address global self-worth, because defensive bias occurs in response to threatened self worth. When confronted with information that is

threatening to one's self-image, the result is an active attempt to dispute the information in order to maintain a stable sense of self worth. For example, upon presentation of a health message that violates current health practices and behaviors, the person is thinking, "I am foolishly engaging in a behavior that has been shown to lead to a life-threatening condition." This violates an individual's self-perception of being a rational informed human being, and leads to defensive processing in order to avoid this blow to global self-worth. This threatened self-image leads to defensive processing of the information, in order to avoid anxiety about behaviors.

Research in this area has shown that affirming another aspect of one's self-worth after presenting threatening health information leads to a reduction of defensive processing (Reed & Aspinwall, 1998; Sherman, Nelson, and Steele, 2000). For example, in a replication of the fibrocystic disease paradigm designed by Kunda (1987), Sherman et al. (2002) found that women most at risk for fibrocystic disease showed less defensive processing if presented with a task in which they rated a central value (such as a social, political, religious, theoretical, or aesthetic value) on a values scale immediately after reading the article about the link between caffeine consumption and fibrocystic disease. If health messages were presented in a way that affirmed an individual's global sense of self worth in addition to presenting threatening health information, individuals may be more likely to heed the advice of the message.

In addition to affirming one's sense of self worth, another way to make health messages more meaningful and salient may be to identify characteristics of people who are more likely to defensively process information. One potential variable effecting defensive processing may be an individual's perceived control over behaviors and risk

factors that lead to negative health conditions. A person who perceives a negative event as controllable by personal actions (e.g., quitting smoking, exercising) may process a threatening health message differently than an individual who believes the health condition to be caused by factors outside of one's control, such as physician prescription. The tendency to engage in defensive processing may differ according to perceptions of control over changing risky behaviors.

If a negative event is perceived as controllable by personal actions, a person will be more likely to engage in defensive responding when confronted with messages that are incongruent with current health practices. A health message may be more anxiety-provoking to an individual who believes that a negative condition is controllable because the image of the self as a rational and competent individual is threatened (Aronson et al, 1999; Kruglanski, 1980, 1990; Pyszczynski & Greenberg, 1987). Upon presentation of the health message, the person is thinking, "Not only am I stupidly engaging in a behavior that has been shown to lead to a life-threatening condition, but the decision to stop is up to me." This threatened self-image leads to defensive processing of the information, in order to avoid anxiety about behaviors.

Or, the opposite may happen. Individuals who perceive a negative event as controllable by personal actions may be less likely to engage in defensive processing because the event is already under their control. It then comes down to weighing the advantages and disadvantages to changing and then acting on that decision.

On the other hand, a person who believes the health condition as caused by factors outside of one's control does not experience a threat to self image because the condition cannot be prevented by personal action, and therefore may not be as driven to

engage in defensive processing to avoid negative self-evaluation. For example, an individual who considers himself to be healthy may be more likely to question the validity of a negative health diagnosis (such as a smoker being diagnosed with the beginning stages of emphysema). In questioning or doubting the negative feedback, the individual may fail to change risky behaviors that led up to the diagnosis. Identifying client's perceived control over health events may help physicians to slant negative health diagnoses in a way that would minimize the immediate defensive reaction.

Perceived Controllability

In an observational study, Weinstein (1982) found that perceived controllability contributed to individual's perceived risk of experiencing health threatening problems throughout their lifetime. Using a sample of college students who were asked to compare their own chances of experiencing 45 health and life threatening problems with the chances of their peers, Weinstein found that participants displayed defensive biases by consistently considering their own chances to be lower than average on 35 out of 45 problems. These health and life problems were familiar and applicable to all segments of the population, such as asthma, hemorrhoids, skin cancer, high blood pressure, etc, and were rated by participants for controllability, stereotype of victims, seriousness, early appearance of symptoms, environmental influences, and heritability.

In attempting to account for the normal tendency of participants to believe they are less at risk than peers, he found that two variables were highly correlated with this face-saving bias: perceived controllability and lack of previous experience with the problem. It seems that individuals tend to believe they are at below average risk for contracting common disorders when the disorder does not run in the family and also

when they believe that behaviors associated with occurrence of the disorder can be controlled. In Weinstein's study (1982), participants appeared to believe that their own self-protective actions were more effective than actions taken by others (such as eating habits, physical fitness); and the more the health problem was seen as being controlled by these actions, the more people tended to believe they would not contract the disease.

Weinstein (1984) expanded previous findings on health risks and the prevalence of optimistic bias in a series of four studies with college-aged participants examining perceptions of susceptibility to health and safety risks. Students were asked to compare their risk in experiencing a number of health problems with that of their peers. The study found that participants were not likely to discount hereditary and environmental risk factors in perceived risk. If there was a family history or environmental influences that placed the individual at increased risk for experiencing a disorder, the individual was likely to account for these factors in making a personal risk estimate.

However, when asked about their own actions in decreasing susceptibility to disease, few participants acknowledged the importance of these factors in preventing undesirable outcomes. In other words, individuals exhibited unrealistic optimism concerning the chance of experiencing undesirable health outcomes when the outcome is perceived to be controllable. For example, participants reported being less at risk for alcoholism than their peers, viewing their own drinking behavior as moderate or limited comparatively. When the risk for contracting a disease like alcoholism is perceived to be controllable rather than external or uncontrollable (like heredity or influences in the environment), students tend to believe that their actions are less risky than peers.

Weinstein (1987) expanded these findings to include a diverse adult population, and

found that adults also show these optimistic biases when asked about susceptibility to experiencing negative outcomes.

In addition, other studies support the findings that individuals who engage in high risk behavior view their own chances of contracting a disease as less than others engaging in the same high risk behavior. Lee (1989) examined perceived risk of contracting three smoking related diseases in a sample of 97 smokers and 95 nonsmokers. Not only were the smokers' ratings of the risk to the average smoker less than the nonsmokers' ratings, but they also estimated their own risks to be lower than that of the average smoker. It seems that even in situations where risks for contracting a disease (such as lung cancer) are more controllable or preventable by personal actions (e.g., quitting smoking), individuals still believe that they are less at risk for contracting the disease.

McKenna, Warburton, and Winwood (1993) also examined smokers' perceptions of risk in experiencing negative health outcomes. Participants in this study were asked to rate the likelihood of future negative life events: smoking associated, health related, and health unrelated. They found that smokers and nonsmokers did not differ in their judgments of health unrelated issues. Differences did emerge between smokers and nonsmokers in judgments of health-related issues: smokers actually perceived their risk for developing health-related problems as higher than non-smokers. However, the smokers estimated that they were less likely to develop a smoking associated disease than the average smoker. Again, even in situations where self-exposure to risk factors is normal, individuals still think they are less at risk than average people engaging in the same high risk behavior.

In summary, research has continually demonstrated the presence of an optimistic bias in individual perception of health threats. In all of these studies, future negative life events were rated for possibility of experiencing the disease. Individuals tended to be optimistic about their own chances of experiencing the health threat as compared to others, even when in engaging in risky health behaviors. However, methods in these studies did not include the introduction of a threatening health message; instead they relied on questions about familiar disorders. The presentation of a threatening health message may have a different impact on individuals who perceive health to be controllable versus individuals who believe that health cannot be controlled. In other words, perceived controllability of health may be a potential moderator in defensive processing. The purpose of this study is to determine if presenting threatening messages regarding an unfamiliar fictitious disorder will reduce defensive bias in a college student population, taking into account individuals' perceived controllability in preventing the disorder from occurring. In this study, perceived controllability will be examined using Wallston and Wallston's (1978) health locus of control model.

Health Locus of Control

It is commonly assumed that those who believe they have control over their health will be more likely to take steps to promote their health, such as not smoking, exercising, etc. (as reviewed by Bell, Quandt, Arcury, McDonald, & Vitolins, 2002; Stickland, 1978; Wallston & Wallston, 1978). This idea has been the focus of many health interventions, with the ultimate goal of helping people to realize that their health is under their control and therefore, behavior can be modified to promote health. Research has strived to predict health behavior by identifying the degree of control over health that individuals

perceive to have, commonly referred to as “Health Locus of Control” (HLC). This area of research has its roots in Rotter’s (1954) social learning theory, which focuses on expectancy beliefs in promoting behavior in specific situations. Rotter (1954) hypothesized that in addition to having expectancy beliefs in specific situations, individuals have beliefs that can be generalized over many situations, according to reinforcement in previous situations. He distinguished between individuals who generally believe that events are a result of their actions (“internals”) and individuals who generally believe that events are a consequence of outside influences that cannot be controlled (“externals”) with the creation of a locus of control scale (Rotter, 1966).

Extending these ideas to a health perspective, it seems that internals would be more likely to take responsibility for promoting their health. Wallston and Wallston (1978) developed the Multidimensional Health Locus of Control Scale (MHLC) in order to examine locus of control in the prediction of health behavior. The MHLC scale measures dispositional expectancy beliefs regarding health along 3 dimensions: the extent to which individuals believe their health is a result of their own actions (internal HLC), the extent to which individuals feel their health is under the control of powerful others, such as physicians (powerful others HLC), and the extent to which individuals believe their health can only be explained by fate (chance HLC). For the purposes of this experiment, internal HLC is the only dimension examined since most research has focused on this dimension (as reviewed by Norman and Bennett, 1996).

Research on the MHLC scale has been somewhat contradictory. Some studies have failed to show a positive relationship between internal locus of control and preventative behavior. For example, Calnan (1989) found a weak positive relationship

between internal HLC and smoking and exercise and a weak negative correlation between internal HLC and alcohol use in two large scale community surveys in New England. Segal and Wynd (1989) found that internal locus of control was not related to successful attempts at smoking cessation, although external locus of control did distinguish between smoker relapse and successful cessation, with relapsers more likely to endorse external HLC. Similarly, Stuart, Borland, and McMurray (1994) did not find a relationship between internal HLC beliefs and pretreatment or post-treatment maintenance of a smoking cessation intervention, although a multivariate analysis showed that treatment attempters had a lower internal HLC than non-attempters. In addition, Nemcek (1990) did not find a relationship between having a high internal locus of control and practicing breast self-examination (BSE) in women.

One argument in response to the contradictory findings is that the MHLC scale does not measure the value placed on health, which may be a potential moderator of the relationship. In response, questions measuring health value were created, and behavior-specific scales were designed. Another argument is that the HLC scale was designed to predict generalized expectancy beliefs and show stronger correlations with the performance of general preventive health behaviors. In other words, as described by Norman and Bennett (1996), “while HLC is specific to a given goal (health), it cuts across a number of situations (smoking, diet, exercise, etc.)” (p. 71). In response to the idea that the MHLC scale better measures trait behavior or dispositional health behavioral tendencies, there was an increase in research to develop situation-specific measures of perceived control.

Other studies have shown a positive relationship between internal health locus of control and preventative health behaviors. For example, Slenker, Price, and O'Connell (1985) found that joggers were more likely to score higher on the internal scale than non-exercisers, and Carlson and Petti (1989) found that college students with high internal locus of control were more likely to engage in high caloric expenditure activities. Kelly, et al. (1990) found that gay men who engaged in unprotected intercourse were less likely to have internal HLC beliefs and were more likely to have higher scores on the HLC chance scale, reflecting the belief that infection with HIV is not so much due to personal control but is rather a function of luck. Shope, Copeland, Maharg, and Dielman (1993) found that adolescents with better alcohol refusal skills had greater internal health locus of control and less alcohol use. Bundek, Marks, and Richardson (1993) found that internal HLC was the most powerful predictor of the frequency with which women practiced BSE in a sample of Hispanic women. Bell et al. (2002) found that older adults with an internal HLC were more likely to limit sugar intake, get adequate sleep, and have a smoke detector in the house. Higher internal HLC scores in this study were associated with older adults having higher levels of physical functioning and reporting good health. Overall, these findings demonstrate the importance of HLC beliefs in practicing preventative behaviors.

Given the positive relationship between health locus of control and preventative health behavior, it may be possible for physicians to match health messages to patient's locus of control. Receiving recommendations concerning a health behavior that is consistent with an individual's HLC may lead to better adherence to doctors' orders. Williams-Piehot et al. (2004) demonstrated that matching HLC to health messages made

women more likely to obtain a mammogram after the intervention than women who received HLC inconsistent information. Women were contacted via telephone and asked a variety of questions concerning HLC, perceived risk, and intentions to schedule a mammogram. Next, brochures were mailed to participants with information that was either consistent or inconsistent with HLC orientation. Holding information about breast cancer and mammography constant, internal HLC brochures focused on the individual as responsible for getting a mammogram: “The Best Thing *You* Can Do For Your Health-Mammography.” The external brochure focused on health care providers as responsible for health: “The Best Thing Medical Science Has to Offer for Your Health-Mammography.” Matched messages were more influential in leading to mammography utilization than mismatched messages.

Quadrel and Lau (1989) also examined how HLC beliefs interacted with the language of a BSE promotional message to influence later BSE behaviors. Women participating in a health project were asked to complete a HLC scale early in the program, and then were randomly assigned to receive one of two mailings advertising a BSE workshop. The content and amount of information contained in these mailings were the same; the only difference was the “control appeal” of the message. One message was entitled “Control Breast Cancer” and contained threatening information about breast cancer and stressed women’s control over health by the performance of BSE. The second pamphlet was entitled “Don’t Press Your Luck” and stressed the random nature of contracting breast cancer. However, after emphasizing the unpreventable nature of the disease, the article went on to say that detection in early stages can lead to successful treatment. In addition, an information brochure on breast cancer from the American

Cancer Society was included, one focusing on self-help through BSE (in the internal condition) and the other focusing on the importance of early detection of breast cancer by performing BSE (external condition). One month later, some of the participants received a “neutral” reminder about BSE performance, which was not slanted in either internal or external HLC direction.

A semester later women in the health program were asked about the frequency of BSE. Although not statistically significant (due to the size of the sample), results showed that individuals who vary in HLC beliefs responded differently to control and chance emphases in health messages. For participants with internal HLC beliefs who received a pamphlet emphasizing self-control, BSE behaviors increased, but only when no neutral reminder was provided. A neutral reminder actually resulted in a decrease in BSE behaviors. The opposite was true for participants with external beliefs who received a pamphlet emphasizing chance control: BSE behaviors increased but only when a neutral reminder was provided. When no neutral reminder was provided, BSE behaviors actually decreased. Overall, this study shows that individual differences in notions of personal control impacts response to health messages and physician advice.

The previous two studies have shown that when individuals receive information consistent with their HLC beliefs, they are more likely to act on the information. Health messages presented in terms of individual HLC may be more effective in decreasing the tendency to engage in defensive processing and initiating health change behaviors. However, research must first establish that HLC is related to the tendency to engage in defensive processing when confronted with threatening health messages.

Present Study

The purpose of the current study was to determine if HLC is related to the tendency to engage in defensive processing, after reading a threatening health message that shows a link between caffeine consumption and fibrocystic disease (the paradigm used by Kunda, 1987). It was predicted that when threatening health messages about the disease are presented, defensive processing in individuals for whom the message is highly relevant (high caffeine consumers) would occur significantly more than in individuals for whom the message is irrelevant. In addition, it was hypothesized that individuals with high internal HLC beliefs would be more likely to engage in defensive processing than individuals with high external HLC beliefs, due to the different perceived controllability of the disease.

Another purpose of this study was to replicate Kunda's (1987) paradigm involving the fibrocystic disease using an internet-based approach. In today's technological era, psychological research conducted on the internet is increasing, and there is an emerging literature that compares web-based results with results obtained in a lab (Birnbbaum, 1999; Horswill & Coster, 2001; Metrik, & Marlatt, 2002; Miller et al., 2002). In a college setting, research conducted online is far less time-consuming, less expensive, and may lead to a bigger sample size. By having larger samples, greater power and more diversity is obtained compared to research conducted in a lab (Birnbbaum, 2004; Musch & Klauer, 2002). According to a review of nine internet-based studies by Krantz, Dalal and Birnbbaum (2000), there is an emerging trend of similar results being obtained by both mediums. However, it is important to establish that internet-based approximations are comparable to lab protocols, and not to assume that data obtained

parallels that collected in a laboratory setting (Birnbaum, 2004; Reips, 2002). By replicating the methods used by Kunda (1987), another purpose of the current study was to determine if an internet-based protocol yields similar results as conducting the study in the lab.

CHAPTER III

III. METHODS

Participants

Participants consisted of 188 college students who engaged in research for course credit. These participants were obtained through an online database via announcements on a main page where participants signed up for participation. Participants' mean age was 20 years ($SD = 3.16$, range = 17-44), and the majority of the participants were freshman ($n = 80$, 42.6%). The sample was 68.1% female ($n = 128$), and 78.2% Caucasian ($n = 147$).

Participants who indicated they had not read the article in the study (an important experimental manipulation described later), or who indicated that they had paid minimal or no attention to the article, were eliminated from the analyses ($n = 56$, 29.8%). In order to control for prior beliefs regarding fibrocystic disease, participants who indicated they had heard about the disease discussed in the study were also eliminated from the data analyses ($n = 32$, 24.2%), although the pattern of results remained identical when these participants were included in the analysis. The demographics of participants who were excluded from analyses did not differ from those who were included according to age ($t(186) = -.50$, $p = .62$), gender ($\chi^2(1, N = 188) = .84$, $p = .43$) or class ($\chi^2(1, N = 187) = .71$, $p = .95$). However, the original sample differed from the final sample in terms of ethnic diversity; 55.6% of the African American participants, 80.0% of the Hispanic/Latino participants, and all of the Asian Americans participants were excluded.

After data exclusion, the analyzed sample ($n = 100$) largely consisted of freshman ($n = 44$, 44.0%), and was 71.0% female ($n = 71$) and 76.0% Caucasian ($n = 76$). Sample characteristics regarding gender, age, ethnicity, and class of each group as well as the entire sample are presented in Table 1.

Measures

Demographics. All participants were asked to provide information about their age, gender, ethnicity, and year in school.

Caffeine consumption. Participants were then asked to indicate how much caffeine they consume using a revised version of the Caffeine Consumption Questionnaire (Landrum, Meliska, & Loke, 1988) and a self-report item devised by Kunda (1987). The revised version of the Caffeine Consumption questionnaire includes 43 questions designed to elicit information regarding total caffeine usage during an average week and weekend day. Participants are asked to estimate their weekly servings of caffeine, specific to consumption of coffee, espresso drinks, tea, soda, energy drinks, and caffeinated medications (like NoDoz, Excedrin, etc.). Estimations of milligrams of caffeine per source were obtained from Landrum (1992) and the American Beverage Association (2006). Weekly servings of caffeine in milligrams were computed for all beverages and medications, and summed together for a final estimation of weekly caffeine consumption (see Table 2). According to Landrum (1992), the original version of this scale has been shown to be a “consistent” predictor of caffeine consumption.

Additionally, participants were asked to estimate their own level of caffeine consumption from the options: “heavy”, “moderate”, “low,” or “no consumption,” in order to be consistent with Kunda’s (1987) paradigm. The purpose of including both

measures was to determine if Kunda's (1987) single question regarding caffeine consumption was a valid estimate of weekly caffeine consumption, or whether a potentially more sensitive measure might allow for a better test of the study hypotheses. Weekly servings of caffeine, as computed from the Caffeine Consumption Questionnaire, were compared to perceived levels of caffeine consumption, as indicated by responses to Kunda's (1987) question.

Multidimensional Health Locus of Control Scale (HLC). Participants then filled out a shortened version of the Multidimensional Health Locus of Control Scale, form A (Wallston & Wallston, 1978). This scale includes questions related to three dimensions: internal, powerful others, and chance HLC. For the purposes of this experiment, internal HLC is the only dimension that was examined. There are six questions examining internal HLC: "If I get sick, it is my own behavior which determines how soon I will get well," "I am in control of my health," "When I get sick I am to blame," "The main thing that affects my health is what I myself do," "If I take care of myself, I can avoid illness," and "If I take the right actions, I can stay healthy." Respondents answered according to a six-point Likert-type scale, ranging from strongly disagree (1) to strongly agree (6). Respondents who indicate that their health is largely under their own control are considered to have internal HLC; respondents who indicate the opposite are considered to have external HLC. This scale has been found to have "adequate" reliability ($\alpha = .68$) and satisfactory validity (Norman & Bennett, 1996). In the current study, the items comprising the internal HLC scale appeared to be internally consistent ($\alpha = .65$).

Post-experimental beliefs. The primary dependent variables in this study were measured in a variety of ways. First, participants were asked to indicate how convinced

they were of the connection between caffeine and fibrocystic disease and the dangerous substance cAMP on a 6-point scale ranging from “not at all convinced” (1) to “extremely convinced” (6). These items were consistent with Kunda’s (1987) paradigm and allowed for direct comparison of the results from the current study to Kunda’s original findings.

Second, a set of post-experimental attitude measures was designed to capture the attitudes about caffeine consumption concerning perceived problem importance, perception of personal risk, and degree of scientific scrutiny about the reported link between caffeine and fibrocystic disease. These variables were modeled after Leffingwell et al. (in press) and Sherman et al. (2000). The first three items asked for participants’ opinions regarding their beliefs in the association between fibrocystic disease and caffeine consumption, degree of seriousness the effects of caffeine are to women’s health, and how important it is that women reduce their caffeine intake. Responses were on a 6-point Likert-type scale ranging from “not at all serious/important” (1) to “very important/serious” (6). In two subsequent items, participants were asked to judge their own personal risk of developing the disease within the next 15 years and how threatened they felt by the information in the article, responding on a 6-point Likert type scale ranging from “minimal risk/not at all threatened” (1) to “high risk/very threatened” (6). In a final pair of items, participants were asked to rate the scientific merit of the study and their confidence that the link between caffeine and the disease has been scientifically proven, answers ranging from “very unscientific/not at all confident” (1) to “very scientific/extremely confident” (6).

A principal components analysis with an oblimin rotation was conducted on the second set of post-experimental beliefs questions (not including Kunda’s (1987) two

items) and revealed three main components: problem importance, personal risk, and scientific merit. These three components accounted for 83.8% of the variance. See Table 3 for the measure items and component loadings. The first component, problem importance, is related to the perceived importance of reducing caffeine consumption and the perceived seriousness of caffeine to women's health. The second component, personal risk, is related to an individual's assessment of his or her own risk and perceived threat of contracting fibrocystic disease. The final component, scientific scrutiny, is related to the degree of confidence in the scientific veracity of the proposed link between caffeine consumption and fibrocystic disease. Each component, based on the salient items, appeared to be internally consistent (problem importance $\alpha = .82$, personal risk $\alpha = .82$, and scientific merit $\alpha = .72$). The scores on these components were used as dependent variables in the following analyses.

Design and Procedure

Participants were asked to participate in this study in order to fulfill a research requirement for psychology classes. Those who expressed interest in participating followed a URL link to the study site. A cover page presented the study as examining people's memory, opinions, and beliefs. Next, participants provided consent to participate, and then completed a demographics form. Subsequently, participants provided answers to the Caffeine Consumption Questionnaire and the MHLC (see Appendix A for all measures used).

Participants then followed a link to an article linking caffeine consumption to fibrocystic disease, as used by Kunda (1987). This article was said to be adapted from the science section of *The New York Times*, although it was largely taken from a medical

journal and the evidence supporting the link was later refuted. This article states that a recent research review concerning the effects of caffeine consumption strongly advises women to avoid caffeine in any form. The article continues to report that the major risk for women is fibrocystic disease, which is related to lumps in the breasts that can go undetected at younger ages but grow progressively into old age, eventually leading to breast cancer. Specifically, the article states that caffeine consumption leads to the irreversible disease by increasing the concentration of a substance called cAMP in the breast, and high concentrations of this substance are found in women with fibrocystic disease and breast cancer.

The article then informs the reader that women who drink two or more cups of caffeine a day for at least one year or longer are the most at risk. This message is considered high or low threat depending on the relevance of the message to the reader. Women who drink more caffeine were considered to be in the high threat condition; women who do not normally consume caffeine were expected to experience low threat or no threat at all. Heavy caffeine users were expected to be less willing to believe the article than people who do not consume heavy amounts of caffeine. However, these results could be due to prior beliefs regarding caffeine. To control for this, men were included in the study as part of the low-threat condition because the disease is reportedly only threatening for females. As described by Kunda (1987), male and female caffeine consumers presumably hold the same beliefs about caffeine prior to the experiment, but only women should be motivated to disbelieve the message due to the personal nature of the threat.

Participants were then directed to a page concerned with recall of different parts of the article. Participants were asked to indicate if they had heard of this disease prior to this study. Those who indicated prior exposure to the disease were not included in data analysis, in order to control for previously-held beliefs about the disease. Next, participants were instructed to recall in as much detail the contents of the findings stated in the article regarding the link between caffeine consumption and fibrocystic disease. The purpose of this question was to ensure an understanding of the connection between the disease and caffeine consumption, and to reinforce the idea that the study was concerned with memory. Respondents then answered a series of questions designed to capture the attitudes and beliefs about caffeine consumption (post-experimental beliefs) which served as the primary dependent variables in this study.

Finally, participants were redirected to a page concerned with instructed completion of the research tasks. Participants were asked if they read the article, and how much attention was devoted to reading the article, with choices ranging from “complete attention” to “minimal” or “no attention.” Participants were then presented with a debriefing statement explaining the deceptive nature of the study and why deception was necessary. Participants read that fibrocystic disease is not necessarily linked to breast cancer and caffeine consumption, but rather is a benign condition frequently associated with a change in ovarian hormones that occurs during the menstrual cycle and menopause. Participants were awarded research credit and then redirected out of the website.

CHAPTER IV

IV. RESULTS

Preliminary Analyses

Caffeine Consumption. Participants were asked to estimate their level of caffeine consumption based on Kunda's (1987) paradigm. Identical to Kunda's (1987) analyses, responses were split into 2 groups. "Heavy" and "moderate" caffeine consumers were designated as "heavy" caffeine consumers and "low" or "no" caffeine consumers were designated as "low" caffeine consumers. Based on this split, rates of caffeine consumption did not differ significantly according to gender ($\chi^2(1, N = 100) = .55, p = .66, \eta = .06$) (see Table 4).

Validity of Kunda's Caffeine Measure. An ANOVA was then conducted to determine if estimations of caffeine consumption, according to Kunda's (1987) question, reflected true estimates of actual caffeine consumption, according to the Caffeine Consumption Questionnaire. It was found that participants made accurate estimations of their caffeine consumption, based on servings of caffeine calculated from the Caffeine Consumption Questionnaire ($F(3, 141) = 24.21, p < .001, \eta^2 = .20$). See Table 5 for average caffeine consumption by Kunda's categories. For the remainder of the analyses, the dichotomized caffeine consumption variable used by Kunda (1987) is reported, although the pattern of results remained the same when the total from the Caffeine Consumption Questionnaire was used, either as a continuous variable or as a dichotomous variable based upon median splits.

HLC. The range of responses provided on the HLC questions were from 19 to 36 (on a scale of 6 to 36), indicating that none of the participants in this sample had an extreme external HLC beliefs (as indicated by low scores); most of them were closer to having internal locus of control beliefs. Therefore, responses provided on the HLC were split into 3 groups: those with high internal HLC (high scorers on the MHLC internal subscale, $n = 18$), those with relatively low internal HLC (the relatively low scorers on the MHLC internal subscale, $n = 35$), and those in between with moderate scores ($n = 46$). This trichotomy of responses was computed based upon cut points established within one standard deviation of the mean of all responses ($M = 28.39$, $SD = 3.53$). According to this split, men and women did not significantly differ on HLC ($\chi^2(2, N = 97) = 2.50$, $p = .29$, $\eta = .16$); nor did heavy and low caffeine consumers ($\chi^2(2, N = 97) = .39$, $p = .54$, $\eta = .06$) (see Table 4).

Primary Analyses

Hypothesis 1. The first hypothesis was that when threatening health messages about the disease were presented, individuals for whom the message is highly relevant (heavy caffeine-consuming women) would be less convinced of the link between caffeine consumption and fibrocystic disease, would rate the problem as less serious, would rate personal risk as similar, and would indicate greater scientific scrutiny of the message than individuals for whom the message was irrelevant. If this pattern of results were observed, it would indicate defensive processing of the health risk message.

A replication of Kunda's (1987) data analysis was conducted, to determine if the results from this study were similar. A between-subjects 2 (caffeine consumption) x 2 (gender) ANOVA was conducted, using Kunda's questions regarding how convinced

participants were of the connection between caffeine and fibrocystic disease and the dangerous substance cAMP. Analyses revealed no significant effects for these variables. Groups were equally convinced of the link between caffeine consumption and fibrocystic disease ($F(1,96) = .09, p = .78, \eta^2 = .00$) and the link between caffeine consumption and the substance cAMP ($F(1,96) = .95, p = .34, \eta^2 = .01$), regardless of message relevance and degree of threat. In other words, an interaction between level of caffeine consumption and gender was not present; heavy caffeine drinking participants most threatened by the information (i.e., women) in the article showed responses similar to low caffeine drinking participants least threatened by the information (low caffeine consuming women and all men) in rating the extent to which they were convinced by the information regarding the negative effects of caffeine (see Table 6 and Figure 1). These results were dissimilar to the results reported by Kunda (1987), who found a significant interaction between gender and level of caffeine consumption, with heavy caffeine consuming women significantly less convinced by the threatening information than low-caffeine consuming women and men.

Hypothesis one was also examined using the dependent variables derived from the principal components analyses. Three between-subjects 2 (caffeine consumption) x 2 (gender) ANOVAs were conducted, using problem importance, personal risk, and scientific merit as dependent variables. It was expected that interactions between gender and level of caffeine consumption would be significant, i.e., women who consume more caffeine would have lower ratings of problem importance and similar ratings of perceived personal risk than low caffeine consuming women and all men. In addition, heavy caffeine consuming women were expected to show more scrutiny of the scientific claim

of a link between caffeine and fibrocystic disease than non-consuming women or all men. Conversely, analyses indicated no significant interactions between gender and level of caffeine consumption for problem importance ($F(1,96) = .07, p = .79, \eta^2 = .00$), personal risk ($F(1,96) = 1.15, p = .29, \eta^2 = .01$), or scientific merit ($F(1,96) = .00, p = .99, \eta^2 = .00$) (see Table 6 and Figure 2).

However, analyses did reveal some findings that were inconsistent with what was expected. Significant main effects for level of caffeine consumption were observed for both ratings of problem importance ($F(1,96) = 5.28, p = .02, \eta^2 = .05$) and personal risk ($F(1,96) = 10.00, p < .01, \eta^2 = .09$). Heavy caffeine consumers rated the effects of caffeine consumption on health as less important than low consumers. This effect was in the direction predicted; heavy caffeine consumers were expected to feel more threatened by the information and therefore minimize the importance of the problem (which is part of defensive processing). However, the heavy caffeine consumers also rated their risk of contracting fibrocystic disease as higher than low consumers. This effect was in the opposite direction than expected; heavy caffeine consumers were expected to rate their personal risk as similar to that of low caffeine consumers (contrary to the health message implication of increased risk), due to the tendency to engage in defensive processing. Additionally, main effects were not found for either gender ($F(1,96) = .60, p = .44, \eta^2 = .01$) or level of caffeine consumption ($F(1,96) = 3.73, p = .06, \eta^2 = .04$) on scientific merit. Heavy caffeine-consuming women were expected to show more scientific scrutiny of the article than low caffeine consuming women and men, as a reaction to feeling threatened by the evidence linking caffeine consumption to fibrocystic disease, but this was not the case.

In addition, main effects were found for gender on both ratings of problem importance ($F(1,96) = 7.93, p = .01, \eta^2 = .08$) and personal risk ($F(1,96) = 30.68, p < .001, \eta^2 = .24$). Men rated the effects of caffeine consumption on women's health as less important than women, and also rated their personal risk of contracting fibrocystic disease as lower than women's risk. This effect is opposite of what was predicted; it was expected that women would rate the effects of caffeine consumption as less important and perceive themselves as less at risk than men, due to the motivation to engage in defensive processing.

This study included men as a control group, similar to Kunda's (1987) original study. Kunda's rationale for the inclusion of men was that, presumably, both men and women held the same beliefs about the effects of heavy caffeine consumption prior to the study, but only women would be motivated to mistrust the information in the article (since it was only applicable to women). Therefore, including men and low caffeine consuming women would further elucidate the presence of defensive processing in situations in which the motivation to do so is high (i.e., the threat of fibrocystic disease in heavy caffeine consuming women). This rationale proved to be true; both heavy and low caffeine consuming men showed less defensive processing than heavy-caffeine consuming women, due to the irrelevance of the threat described in the article (Kunda, 1987).

However, the men included in the current study did not provide a pattern of results similar to the men included in Kunda's (1987) study. Instead, men's risk appraisals varied across level of caffeine consumption. As a result, women's appraisals of problem importance and risk (according to level of caffeine consumption) may have been

masked by the unexpected responses of the men included in the study. For this reason, men were excluded from the analysis and only women's results were examined ($N = 70$).

Women Only. First, t -tests were conducted on levels of caffeine consumption using Kunda's questions regarding how convinced participants were of the connection between caffeine and fibrocystic disease and the dangerous substance cAMP. Again, analyses revealed no significant effects for these variables. Both heavy and low caffeine consuming women were equally convinced of the link between caffeine consumption and fibrocystic disease ($t(68) = .54, p = .59, d = .13$) and the link between caffeine consumption and the substance cAMP ($t(68) = .53, p = .60, d = .13$), regardless of the degree of threat. In other words, women most threatened by the information in the article (heavy caffeine consumers) showed responses similar to the least threatened participants (low caffeine consumers) in rating the extent to which they were convinced by the information regarding the negative effects of caffeine (see Table 7 and Figure 3). Again, these results were dissimilar to the results reported by Kunda (1987).

Heavy and low caffeine consuming women were also examined using a one-factor, between subjects multivariate analysis of variance (MANOVA), following the recommendations provided by Grice & Iwasaki (in press) . The components derived from the principal components analysis (problem importance, personal risk, and scientific merit) served as the dependent variables in the analysis, and levels of caffeine consumption (heavy and low) comprised the independent variable. The assumptions underlying MANOVA did not reveal any notable violations, and the bivariate correlations (for the dependent variables) are presented in Table 8.

Results from the MANOVA were statistically significant according to Wilke's $\Lambda = (.69)$, $F(3, 69) = 10.20$, $p < .001$. Furthermore, Roy's greatest characteristic root (g.c.r.) was statistically significant ($s = 1$, $m = .5$, $n = 32.5$, $p < .001$) and indicated that the independent variable and combination of dependent variables shared 31.3% of their variance. Univariate means, standard deviations, and the unstandardized discriminant function coefficients are shown in Table 9. Following the MANOVA analysis strategy recommended by Harris (2001), a simplified multivariate composite was created from the discriminant function coefficients, and was equal to: (1) problem importance + (1) scientific merit + (-1) personal risk. This simplified, multivariate composite captures the differences in the patterns of means of the dependent variables across heavy and low caffeine consumers.

Conceptually, this multivariate composite represents a defensive processing style which was labeled as "low risk recognition." The opposite of this style was labeled "high risk recognition." As can be seen in Figure 4, the groups differed in their endorsement of problem importance, personal risk, and scientific merit. Specifically, the heavy caffeine consumers indicated that the problem of fibrocystic disease was less important, reported being higher at risk, and indicated the article had less scientific merit than the low caffeine consumers. This was relabeled as "high risk recognition" because even though the heavy caffeine consuming women rated the problem as less important and the study as having less scientific merit (which are both characteristics of defensive processing), they were able to recognize that their risk of contracting fibrocystic disease was higher than others (i.e., low caffeine consuming women). The opposite pattern of means was observed for the low caffeine consumers, and was labeled "low risk recognition" because

even though these participants rated the importance of the problem and the scientific merit of the study as higher, they were able to recognize their risk was lower than others (i.e., heavy caffeine consuming women).

The heavy and low caffeine consuming women differed on the simplified multivariate composite representing “low risk recognition” ($F(1,69) = 24.27, p < .001, \eta^2 = .26, M_{low} = 13.16, SD_{low} = 2.94; M_{heavy} = 9.44, SD_{heavy} = 3.42$), according to a fully adjusted post hoc criterion for statistical significance (Harris, 2001). Overall, results of the MANOVA showed that heavy caffeine consuming women differed from low caffeine consuming women on the composite according to estimates of personal risk, with heavy caffeine consuming women perceiving their risk as higher than low caffeine consuming women. It seems that both groups made accurate perceptions regarding their level of risk of contracting fibrocystic disease (i.e., heavy caffeine consumers rated their risk as higher) which is not indicative of defensive processing of threatening information.

It was expected that the multivariate composite obtained from the MANOVA would provide an index of defensive processing that would differentiate between the heavy and low caffeine consuming women. However, due to the unexpected tendency of heavy and low caffeine consuming women to make reliable estimates of personal risk, the results of the MANOVA did not indicate if the two groups differed on the other variables in the composite (i.e., problem importance and scientific merit). Consequently, *t*-tests were conducted on levels of caffeine consumption to determine if there were differences between the groups on problem importance, personal risk, and scientific merit. Again, it was expected that heavy caffeine consuming women would engage in defensive processing and rate the problem as less important, personal risk as lower, and show more

scrutiny of the article than low caffeine consuming women. Analyses indicated no significant differences between groups in ratings of problem importance ($t(68) = 2.04, p = .05$) or scientific merit ($t(68) = .178, p = .08$), although the groups differed on estimates of personal risk ($t(68) = -3.88, p < .01$). Again, heavy caffeine consuming women rated their risk of contracting fibrocystic disease as higher than low caffeine consuming women.

Hypothesis 2. The second hypothesis was that individuals with internal HLC beliefs would be more likely to engage in defensive processing than individuals with external HLC beliefs, depending on threat relevance (gender and level of caffeine consumption). In other words, those with high internal HLC beliefs were expected to show more defensive processing, i.e., rate the problem as less important/low risk/not very scientific. Again, due to the discrepancy in the pattern of results reported by the men in Kunda's (1987) study and the current study, men were not included in these analyses. Using women only, five between-subjects 2 (caffeine consumption) \times 2 (HLC) ANOVAs were conducted, using Kunda's (1987) variables (regarding how convinced participants were of the link reported in the article) and the components derived from the principal components analysis (problem importance, personal risk, and scientific merit) as dependent variables, in order to determine if there was an interaction between HLC and message relevance upon caffeine attitudes.

Analyses indicated no significant interactions between level of caffeine consumption and HLC on Kunda's variables regarding how convinced participants were of the link between caffeine consumption and fibrocystic disease ($F(1,66) = .34, p = .71, \eta^2 = .01$) and the dangerous substance cAMP ($F(1,66) = .77, p = .47, \eta^2 = .02$). In

addition, analyses indicated no significant interactions between level of caffeine consumption and HLC on problem importance ($F(1,66) = .28, p = .76, \eta^2 = .01$), personal risk ($F(1,66) = .26, p = .77, \eta^2 = .01$), or scientific merit ($F(1,66) = .75, p = .48, \eta^2 = .02$) (see Table 10). It appears that HLC beliefs did not have an effect on defensive processing in this study; caffeine consuming women with high internal HLC beliefs were not more likely to engage in defensive processing than caffeine consuming women with low internal/high external HLC beliefs, as hypothesized. However, due to the range restriction on HLC beliefs in this sample, it is not possible to draw conclusions about rates of defensive processing between those with internal versus external HLC beliefs.

CHAPTER 5

V. DISCUSSION

The purpose of the present study was to investigate if presenting high and low threat messages regarding an unfamiliar fictitious disorder would affect defensive processing in a college student population, using an internet-based replication of Kunda's (1987) paradigm. Furthermore, the study sought to determine if internal or external HLC would moderate processing of threatening health messages.

First, the relationship between message relevance and defensive processing was examined. It was expected that when threatening messages about a disease were presented, participants for whom the message was highly relevant would be less convinced of the link between fibrocystic disease and caffeine consumption, would rate the problem as less serious, would perceive personal risk to be similar, and would show greater scientific scrutiny of the message than participants for whom the message is irrelevant. First, analyses were conducted with both men and women who had no prior knowledge of fibrocystic disease and indicated they had read and paid attention to the article. Using the questions proposed by Kunda (1987) regarding how convinced participants were of the link between caffeine consumption and fibrocystic disease and the dangerous substance cAMP, results indicated that groups were equally convinced, despite message relevance, according to gender. These results were contrary to results reported by Kunda (1987), who showed that groups were different when considering gender by message relevance (i.e, caffeine consumption). In addition, using questions

similar to those used by Sherman et al. (2000) and Leffingwell et al. (in press), results indicated that heavy caffeine consuming women did not engage in defensively biased processing (i.e., rate fibrocystic disease as less important/less at risk/greater scientific scrutiny) than low caffeine consuming women and all men, as hypothesized.

These results were surprising given the motivation to engage in defensive processing across participants. The article linking caffeine consumption to fibrocystic disease reported that women who drank two or more cups of coffee a day were most at risk. As a result, heavy caffeine consuming women were expected to be highly threatened by the article, and thus be more motivated to dispute or minimize the link. Low caffeine consuming women and men were expected to be less threatened by the article and therefore be less motivated to engage in defensive processing and rather accept the link reported in the article.

Even though the article linking caffeine consumption to fibrocystic disease was only pertinent to women, the current study included men as a control group, similar to Kunda's (1987) original study. Kunda's (1987) rationale for the inclusion of men was that, presumably, both men and women held the same prior beliefs about the effects of heavy caffeine consumption, but only women would be motivated to mistrust the information in the article (since it was only pertinent to women). Therefore, it was expected that including men would further elucidate the presence of defensive processing between message-relevant and message-irrelevant participants, similar to the results reported by Kunda (1987). The men in Kunda's (1987) study reported being more convinced of the link between

caffeine consumption and fibrocystic disease than women, regardless of their degree of caffeine consumption, while women differed according to level caffeine consumption (with heavy caffeine consuming women reporting being less convinced of the link). However, in the current study, men were just as convinced as women of the link proposed in the article.

In addition, men in the current study differed on their ratings of problem importance and perceived risk, according to level of caffeine consumption. Participants who indicated being heavy caffeine consumers rated their risk as higher and the problem importance as lower than low caffeine consumers. This was surprising because men were predicted to give similar ratings to these questions, regardless of level of caffeine consumption. In addition, heavy caffeine consuming participants in this sample exhibited defensive processing; they rated the problem of fibrocystic disease as less important than low caffeine consuming participants. However, it was expected that ratings of problem importance would not differ for men; both heavy and low caffeine consuming men would rate the problem as similarly important. Even though the article stated that fibrocystic disease was only relevant for caffeine consuming women, the men in this sample nevertheless perceived it to be somewhat applicable to them. Reasons for this finding are unclear. Perhaps, recent attempts on the part of the American Cancer Society (2006) and CNN News (2005) to raise public awareness about the incidence of breast cancer in men has affected men's perceptions about breast cancer being solely a "women's disease."

Due to the unexpected responses of the men included in the current study, women's appraisals of problem importance and risk (according to level of caffeine consumption) of fibrocystic disease may have been masked. The defensive bias literature was re-examined to determine if previous replications of Kunda's (1987) study yielded similar effects. Examination of the literature revealed that other replications of Kunda's (1987) paradigm did not include men as part of the study (Lieberman & Chaiken, 1992; Sherman et al., 2000). For this reason, men were excluded from the analysis and only women's results were examined.

Follow-up analyses were then conducted with only women participants who had no prior knowledge of fibrocystic disease and indicated they had read and paid attention to the article. Again, using the questions proposed by Kunda (1987), the results indicated that despite message relevance, women were equally convinced of the threat between caffeine consumption and fibrocystic disease, contrary to results reported by Kunda (1987). A potential reason for the failure to replicate Kunda's (1987) results lies in the responses given by low caffeine consuming women. In the current study, low caffeine consuming women indicated being less convinced of the link reported in the article than the low caffeine consuming women in Kunda's (1987) study. Similar to heavy caffeine consuming women, low caffeine consuming women may have also perceived the message as partially relevant to their own caffeine consumption, leading them to report being less convinced by the link proposed in the article.

In addition, analyses were conducted using questions similar to those used by Sherman et al. (2000) and Leffingwell et al. (in press). Results indicated that despite message relevance, defensive processing of the threatening information did not occur. Unlike results shown by Liberman and Chaiken (1992) and Sherman et al. (2000), heavy caffeine consuming women did not engage in more defensive processing than low caffeine consuming women. It was expected that heavy caffeine consuming women would perceive the problem of fibrocystic disease as less important than low caffeine consuming women. By minimizing the threat of the article and rating the problem of fibrocystic disease as less important, heavy caffeine consuming women would be able to reduce the anxiety associated with the fear of contracting fibrocystic disease and the threat to their self-image as rational beings, in light of the tendency to consume heavy amounts of harmful substances. However, the women in this sample did not differ on ratings of problem importance according to level of caffeine consumption; heavy caffeine consuming women were not motivated to minimize the threat of fibrocystic disease.

Due to the correspondence between the risk for fibrocystic disease reported in the article and participants' levels of caffeine consumption, the heavy caffeine consuming women were also expected to challenge the credibility of the threatening information. By devoting more energy to processing the threatening information and challenging the scientific value behind it, women particularly threatened by the article would be able to minimize the threat of the link between caffeine consumption and fibrocystic disease. Again, the women in this sample

did not differ on their ratings of scientific merit, according to level of caffeine consumption. Heavy caffeine consuming women in this sample were not motivated to minimize the threat of the article by challenging the scientific value behind it.

Additionally, it was expected that heavy caffeine consuming women would engage in defensive processing when asked to estimate their own levels of personal risk of contracting fibrocystic disease. Previous research has demonstrated that estimates of personal risk vary according to the significance of a threatening message; those who are threatened by the information contained in a health message are more likely to minimize their own personal risk of the disease, compared to those for whom the message is irrelevant. However, findings indicated that this is not the case. In the current study, heavy caffeine consuming women actually acknowledged their heightened risk for contracting fibrocystic disease.

This finding was surprising in two respects. First, it was surprising because defensive processing occurs in response to the anxiety experienced upon viewing a threatening health message that is inconsistent with current health practices (i.e., heavy caffeine consumption). Minimizing one's personal risk of experiencing the negative consequences of the message allows one to relieve this anxiety and maintain an optimistic perspective about one's health, in addition to preserving a sense of oneself as a rational person (who is not engaging in a behavior that leads to a life-threatening condition). The ability to acknowledge one's heightened risk of experiencing negative consequences in response to a

threatening health message has not been consistently demonstrated in the defensive bias literature. Second, this finding was surprising when taking into account the findings regarding perceived problem importance, as reported above. Presumably, perceiving one's risk of contracting fibrocystic disease as higher due to heavy caffeine consumption would also lead one to recognize that the problem of fibrocystic disease is more important. However, this was not the case. Heavy caffeine consuming women logically perceived their heightened risk of contracting fibrocystic disease, yet did not differ from low caffeine consuming women on their ratings of problem importance.

It is unclear why heavy caffeine consuming women accurately rated their risk of contracting fibrocystic disease as higher but failed to recognize the increased importance of the problem, although three explanations are offered. First, the questions estimating personal risk may better be described as a manipulation check rather than an index of defensive bias. Liberman and Chaiken (1992) replicated Kunda's (1987) paradigm, including questions which measured the degree to which participants recognized the relevancy of the threatening health message. These questions served as an experimental manipulation check, in order to ensure that the women most threatened by the article actually recognized the increased personal relevancy of the message, yet still engaged in defensive processing (Liberman & Chaiken, 1992). Similarly, heavy caffeine consuming women in the current study may have recognized that the message was more applicable to them and thus made higher estimates of personal risk, yet failed to acknowledge the increased importance of the problem.

Another explanation for the unexpected finding may have to do with current rates of caffeine consumption in the U.S., compared to the rates of caffeine consumption described in the article. The article linking caffeine consumption to fibrocystic disease stated that women who consume two or more cups of coffee daily are most at risk. According to the American Beverage Association (2006), one 8 ounce cup of coffee is equivalent to 200 mg of caffeine. Calculated across an average week, women in the article were consuming approximately 1400 mg of caffeine weekly. In the current study, women reported consuming a mean of 833 mg of caffeine weekly, with a maximum of 2790 mg. In addition, 18% of the women in this sample were consuming 1400 mg or more of caffeine on a weekly basis. Due to the lack of information regarding average weekly caffeine intake in Kunda's (1987) experiment, it is possible that participants in the current study were consuming larger amounts of caffeine than the participants in Kunda's study.

According to research conducted on caffeine consumption at the John Hopkins Medical Center (2003), rates of caffeine consumption have dramatically increased over the past decades, with the average adult consuming approximately 280 mg of caffeine daily (1960 mg of caffeine weekly). Therefore, the article used by Kunda (1987) may not be representative of current trends in caffeine consumption. Women in the current study may have perceived such a notable discrepancy between their own caffeine consumption and the risky amount reported in the article that they were motivated to acknowledge their heightened risk. Minimizing personal risk allows one to maintain a sense of self as a rational,

health-conscious person. In this situation, minimizing the degree of personal risk may not have been face-saving in light of the potentially large discrepancy between caffeine consumption reported in the article and consumption reported by the women in the sample. Attempting to discount such an elevated risk may have been more threatening to one's sense of self as a logical, health-conscious being. However, in response to the anxiety provoked by acknowledging the heightened risk for fibrocystic disease, women may have responded by failing to rate the disease as more important than low caffeine consuming women.

Another reason for the unexpected finding that heavy caffeine consuming women acknowledged their heightened risk for fibrocystic disease may include the presence of other influential variables accounting for the response to the article. As mentioned before, effects of health messages may be moderated by other factors, such as perceived social pressure to engage in the behavior, as shown by Ajzen's Theory of Planned Behavior (1991). Heavy caffeine consuming women may have acknowledged their heightened risk of fibrocystic disease due to prior pressure from family or friends to lessen excessive caffeine intake, which may have increased sensitivity to recognizing the threatening effects of heavy caffeine usage. On the other hand, the presence of a positive family history of breast cancer may have increased sensitivity to developing fibrocystic disease, and eventually breast cancer. Outside sources affecting the relevancy of the threatening message were not controlled for in the current study.

In addition to replicating Kunda's (1987) findings, the current study sought to determine if internal or external HLC was related to processing of

threatening health messages. Research has supported the idea that those who believe they have control over their health are more likely to take steps to promote health (as reviewed by Wallston & Wallston, et al., 1978). For example, women who perceive control over preventing fibrocystic disease may decrease caffeine intake in response to an article linking the two. Relatedly, it was expected that individuals with high internal HLC beliefs would be more likely to engage in defensive processing than individuals with high external beliefs when confronted with a threatening health message, due to the perceived controllability of the disease. Analyses with only heavy and low caffeine consuming women revealed that internal HCL beliefs were not related to the tendency to engage in defensive processing in response to threatening health messages. Despite the amount of caffeine consumption reported, internal HLC beliefs did not appear to moderate the degree of defensive processing exhibited by the women in this sample.

However, conclusions cannot be drawn for the relationship between defensive processing and external HLC beliefs, due to the range restriction of HLC beliefs reported by women in this sample. The lowest score obtained by participants in this sample was above the midway point for indication of internal HLC, so the sample only provided a range of scores ranking from high internal to low internal HLC (or potentially high external, although this cannot be validated due to range restriction). Other studies have showed similar range restriction, although splits based on extreme group scores or different analysis techniques have shown significant differences between groups (Bell et al., 2002; Carlson & Petti, 1989).

Regardless of the body of literature that has linked HLC beliefs to the practice of preventative health behaviors, the current study failed to show a relationship between internal health locus of control and the degree of defensive processing exhibited in response to threatening health messages. Some reasons for this finding are presented. First, as proposed in a review by Norman and Bennett (1996), the HLC may only measure dispositional health expectancy beliefs, and fail to tap into situation-specific measures of perceived control. A fibrocystic disease specific HLC measure may have shown a stronger relationship between situation specific HLC beliefs according to level of caffeine consumption. Or, overall, the HLC may not be a good indicator of beliefs regarding the perceived controllability of a disease. This use of this scale has received mixed reviews in the literature (according to a review by Norman & Bennett, 1996); it may have been more effective to measure perceived controllability of a disease using questions that tap into intentions to change risky behaviors, attitudes towards changing, and influence of social norms, modeled after Ajzen's Theory of Planned Behavior (Armitage, Norman, & Conner, 2002).

Finally, another reason for the finding that HLC is unrelated to defensive processing is that the current study obtained ratings of defensive processing immediately after the article was presented. The tendency to engage in defensive processing in response to a threatening health message may be an immediate reaction, uninfluenced by an individual's perceived control over their own health. HLC beliefs may come into play after the initial defensive reaction to a threatening health message occurs, and lead to later behavior change.

Several limitations in the current study are acknowledged. First, due to the lack of random assignment to either the high or low threat condition (heavy or low caffeine consumption), a selection threat is present, limiting the degree of causal inference that can be made between message relevance and defensive reactions. Participants included in either condition may be inherently different from one another, such as experiencing past pressure to limit caffeine consumption or possessing a positive family history of breast cancer. Due to uncontrolled variability between heavy and low caffeine consuming women, it is unclear whether defensive processing occurred as a result of the threatening health message, or in response to other outside factors.

Another potential limitation of this study is its internet-based approach. One purpose of the current study was to replicate Kunda's (1987) study using an online approach, but replication was not obtained. Despite recent reviews showing that results obtained from internet studies are similar to results obtained from laboratory-based studies (Krantz et al., 2002), the internet may not be the appropriate medium of data collection when examining defensive reactions to threatening health messages. Because this study was online, it is unclear what kind of environment participants completed the study in, and external distractions may have prevented the participants from fully concentrating on the survey. Lack of standardized testing environments may prohibit conclusions to be drawn regarding a causal relationship between message relevance, HLC, and defensive processing. On the other hand, the internet-based application of Kunda's (1987) paradigm may contain higher degrees of external validity, due to the real-world

applicability of the design. Attempting to measure defensive bias in laboratory settings may be inherently flawed because of the lack of external distractions typically present when processing threatening health messages in real-life settings. The results obtained by the current study may be more indicative of reactions to health messages outside of laboratory settings, although replication of the study comparing results from internet and laboratory settings is warranted to draw this conclusion.

Conclusions

In sum, the current study did not replicate previous studies' results pertaining to the tendency to engage in defensive processing in response to a threatening article. Studies using the unfamiliar disease paradigm have previously found that women who were threatened by the health message were most likely to engage in defensive processing by discounting the seriousness of the threat and question the legitimacy of the reported information (Kunda, 1987, Liberman & Chaiken, 1992, Sherman et al., 2000). Contrary to what was expected, women in the current study who were most threatened by the health message (i.e., heavy caffeine consumers) did not engage in defensive processing and minimize the problem importance and question the scientific merit behind the findings, compared to women less threatened by the evidence in the message (i.e., low caffeine consumers). However, heavy-caffeine consuming women in the current study acknowledged their heightened threat of contracting fibrocystic disease, which is a unique finding in the defensive bias literature. Instead of serving as indices of defensive processing, the questions regarding personal risk may rather

be perceived as a message threat manipulation check, similar to questions used by Liberman and Chaiken (1992). Other explanations for the unexpected finding are the significantly high rates of caffeine consumed by the women in the sample, or the influence of other moderating variables such as social pressure to avoid caffeine use. In addition, this study failed to find a relationship between HLC and defensive bias. However, women in the current sample only endorsed internal HLC beliefs, so conclusions cannot be drawn regarding differences in defensive processing between individuals with external and internal HLC beliefs.

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Appendix A

Tables

Table 1

Participant Characteristics after Exclusions

	Entire Sample (<i>N</i> =188)	Read/Paid Attention (<i>N</i> = 132)	No Knowledge of Disease (<i>N</i> = 100)
Gender			
Male	60 (31.9%)	37 (28.0%)	29 (29.0%)
Female	128 (68.1%)	95 (72.0%)	71 (71.0%)
Ethnicity			
African-American	9 (4.8%)	6 (4.5%)	4 (4.0%)
Asian-American	4 (2.1%)	0	0
Caucasian	147 (78.2%)	104 (78.8%)	76 (76.0%)
American Indian	19 (10.1%)	17 (12.9%)	15 (15.0%)
Hispanic/Latino	4 (2.1%)	1 (.8%)	1 (1.0%)
Other	5 (2.7%)	4 (3.0%)	4 (4.0%)
Class			
Freshman	80 (42.6%)	51 (38.6%)	44 (44.0%)
Sophomore	42 (22.3%)	30 (22.7%)	21 (21.0%)
Junior	31 (16.5%)	24 (18.2%)	18 (18.0%)
Senior	32 (17.0%)	26 (19.7%)	16 (16.0%)
Graduate	2 (1.1%)	1 (.8%)	1 (1.0%)
Age	20.40 (17-44)	20.43 (17-40)	20.29 (17-40)

Note. Percentages in parentheses for gender, ethnicity, and class; ranges in parentheses for age.

Table 2

Average Weekly Caffeine Consumption

Beverage/Medication	Average Caffeine Intake (mg)	Standard Deviation (mg)
Coffee (8 oz)	188.00 mg	345.03 mg
Tea (8 oz)	166.95 mg	219.92 mg
Espresso	94.00 mg	206.86 mg
Soda (12 oz)	252.80 mg	246.76 mg
Medications	45.49 mg	122.02 mg
Total mg	816.04 mg	642.56 mg

Note. N = 100

Table 3

Loadings for Post-Experimental Beliefs

Item	Components (Eigenvalues in parentheses)		
	1 (2.70)	2 (1.46)	3 (.87)
Importance of reducing caffeine consumption in order to avoid consequences	.910	.258	.323
Seriousness of effects of caffeine to women's health	.916	.267	.394
How at risk are you for developing fibrocystic disease within next 15 years	.189	.926	.084
How much do you feel personally threatened by the information about consequences of caffeine consumption	.325	.916	.131
Rate the scientific merit of the study finding in the article	.257	.097	.929
Confidence in the link between caffeine consumption and fibrocystic disease	.580	.142	.832

Note. Items in bold loaded on component and were summed to create a composite score.

Component Score Correlation Matrix

Item	Component		
	1	2	3
Importance of caffeine reduction	.769	-.138	-.469
Seriousness of effects	.804	-.166	-.410
How at risk	.500	.756	.201
Personally threatened	.596	.692	.114
Scientific merit	.564	-.432	.609
Confidence in findings	.734	-.418	.242

Table 4

Chi Square Analyses for Differences between Gender, Caffeine Consumption, and HLC

	Caffeine Consumption		χ^2	$p \leq$
	heavy	low		
Gender			.55	.66
Male	17	37		
Female	12	34		
HLC			.39	.54
Low Internal	18	17		
Moderate	25	21		
High Internal	10	8		
	Gender		χ^2	$p \leq$
	Male	Female		
HLC			2.50	.29
Low Internal	7	28		
Moderate	15	31		
High Internal	7	11		

Note. $F(3, 141) = 24.21, p < .001$

Table 5

Caffeine Consumption Questionnaire by Kunda's Variables

Caffeine Use	Caffeine Consumption Questionnaire		
	<i>n</i>	<i>m</i>	<i>SD</i>
No consumption	6	102.00	89.05
Low use	48	609.80	490.13
Moderate use	36	852.96	615.65
Heavy use	10	1351.60	826.37

Table 6

ANOVAs for Hypothesis One: Interactions of Gender x Caffeine Consumption on Dependent Variables

Variable	Caffeine Consumption		<i>F</i>	<i>p</i> ≤	η^2
	Heavy	Low			
Convince			.08	.78	.00
Male	3.5 (1.24)	3.76 (1.03)			
Female	3.71 (.91)	3.84 (1.12)			
Convince 2			.93	.34	.01
Male	3.50 (1.17)	4.06 (.97)			
Female	3.79 (.91)	3.92 (1.06)			
Problem Importance			.07	.79	.00
Male	7.25 (2.14)	8.41 (2.48)			
Female	8.65 (2.12)	9.20 (1.68)			
Personal Risk			1.15	.29	.01
Male	3.58 (2.81)	2.59 (1.78)			
Female	6.85 (2.06)	4.84 (2.29)			
Scientific Merit			.00	.99	.00
Male	7.33 (2.10)	8.12 (1.45)			
Female	7.65 (1.70)	8.43 (1.98)			

Note: Means are listed for each group (with standard deviations listed in parentheses). Convince 1 refers to how convinced participants are of the link between caffeine consumption and fibrocystic disease, & convince 2 refers to how convinced participants are of the link between caffeine consumption and the dangerous substance cAMP, and are on a scale from 1 to 6. All other dependent variables are on a scale from 2 to 12.

Table 7

Independent Samples t-test for Caffeine Consumption on Kunda's Variables (women only)

Variable	Caffeine Consumption		<i>t</i>	<i>p</i> ≤	<i>d</i>
	Heavy	Low			
Convince 1 (<i>n</i> = 71)	3.71 (.91)	3.84 (1.12)	.54	.59	.13
Convince 2 (<i>n</i> = 71)	3.79 (.91)	3.92 (1.06)	.53	.60	.13

Note: Means are listed for each group (with standard deviations listed in parentheses). Convince 1 refers to how convinced participants are of the link between caffeine consumption and fibrocystic disease, & convince 2 refers to how convinced participants are of the link between caffeine consumption and the dangerous substance cAMP. All dependent variables are on a scale from 1 to 6.

Table 8

Intercorrelations among Dependent Variables (women only)

Dependent Variable	Problem Importance	Personal Risk	Scientific Merit
Problem Importance	1.00	-	-
Personal Risk	.233	1.00	-
Scientific Merit	.585*	.186	1.0

*Correlation is significant at the .01 level, 2-tailed.

Table 9

Means, Standard Deviations, and Discriminant Function Coefficients for Caffeine Consumption on Dependent Variables (women only)

Dependent Variable	Group	<i>M</i>	<i>SD</i>	w_s
Problem Importance	Heavy	8.65	2.12	.571
	Low	9.57	1.68	
Personal Risk	Heavy	6.85	2.06	-1.00
	Low	4.84	2.29	
Scientific Merit	Heavy	7.65	1.70	.31
	Low	8.43	1.98	

Note. Heavy and low refer to level of caffeine consumption. w_s = coefficients from the standardized discriminant function

Table 10

ANOVAs for Hypothesis Two: Interactions of Caffeine Consumption x HLC on Dependent Variables

Variable	Caffeine Consumption			<i>F</i>	<i>p</i> ≤	η^2
	Low Internal	Moderate	High Internal			
Convince				.34	.71	.01
Low	3.63 (1.23)	4.00 (1.00)	4.00 (1.22)			
Heavy	3.58 (.90)	3.63 (.96)	4.17 (.75)			
Convince 2				.77	.47	.02
Low	3.63 (1.15)	4.07 (1.03)	4.40 (.89)			
Heavy	3.83 (.72)	3.75 (1.12)	3.83 (.75)			
Problem Importance				.21	.81	.01
Low	9.50 (1.55)	9.60 (1.64)	9.60 (2.61)			
Heavy	8.83 (1.64)	8.31 (2.55)	9.17 (1.83)			
Personal Risk				.26	.77	.01
Low	4.44 (2.36)	5.47 (2.29)	3.80 (1.79)			
Heavy	6.92 (2.06)	7.12 (1.89)	6.00 (2.60)			
Scientific Merit				.75	.48	.02
Low	7.75 (2.14)	8.60 (1.72)	9.80 (1.64)			
Heavy	7.58 (1.44)	7.31 (1.96)	8.67 (1.21)			

Note: Means are listed for each group (with standard deviations listed in parentheses). Convince 1 refers to how convinced participants are of the link between caffeine consumption and fibrocystic disease, & convince 2 refers to how convinced participants are of the link between caffeine consumption and the dangerous substance cAMP, and are on a scale from 1 to 6. All other dependent variables are on a scale from 2 to 12.

Appendix B

Figures

Figure 1. Interactions between gender and caffeine consumption for Kunda's variables convince 1 and convince 2.

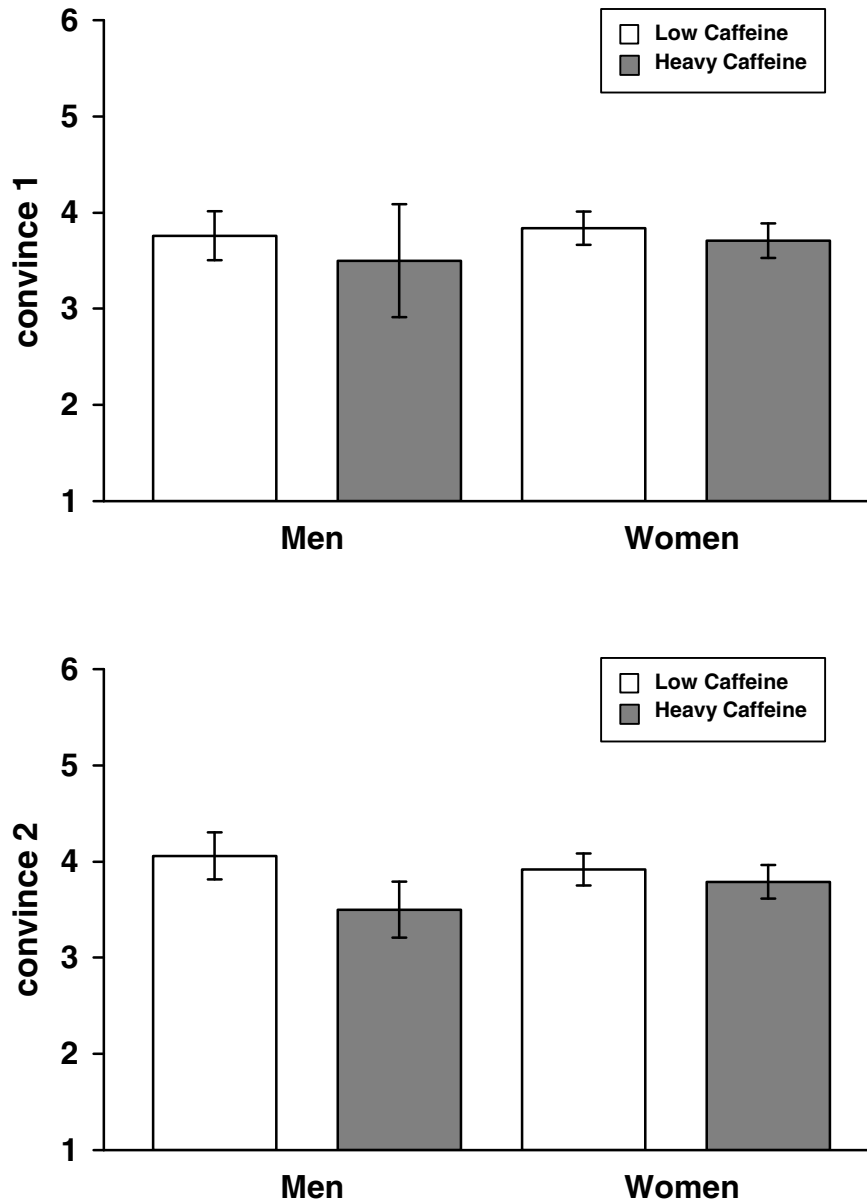


Figure 1. Convince 1 refers to how convinced participants are of the link between caffeine consumption and fibrocystic disease, & convince 2 refers to how convinced participants are of the link between caffeine consumption and the dangerous substance cAMP. Variables are on a scale from 1 to 6. Error bars are standard errors.

Figure 2. Interactions between gender and caffeine consumption on dependent variables problem importance, personal risk, and scientific merit.

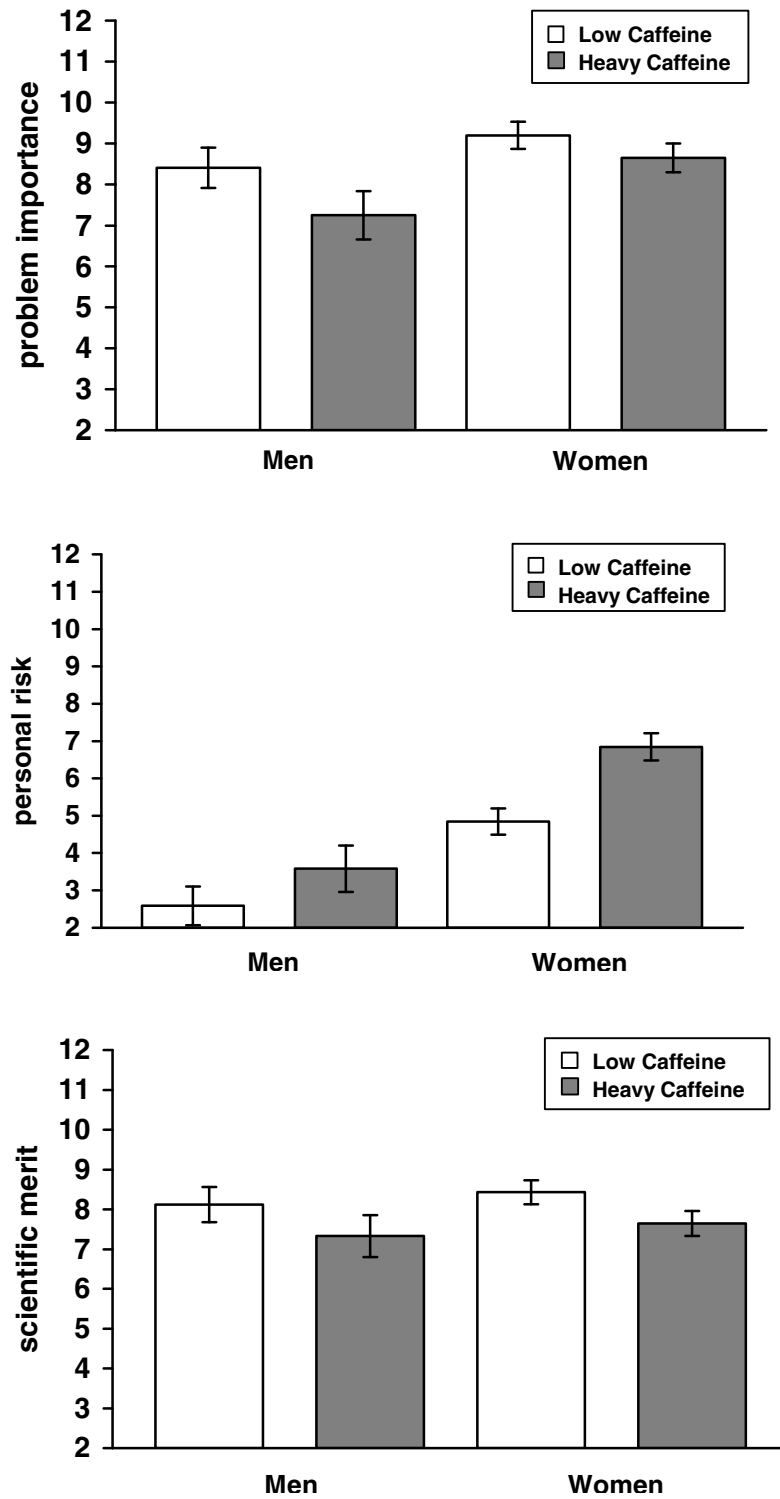


Figure 2: Variables are on a scale from 2 to 12. Error bars are standard errors.

Figure 3. Women only: Independent samples *t*-tests for caffeine consumption on Kunda's variables convince 1 and convince 2.

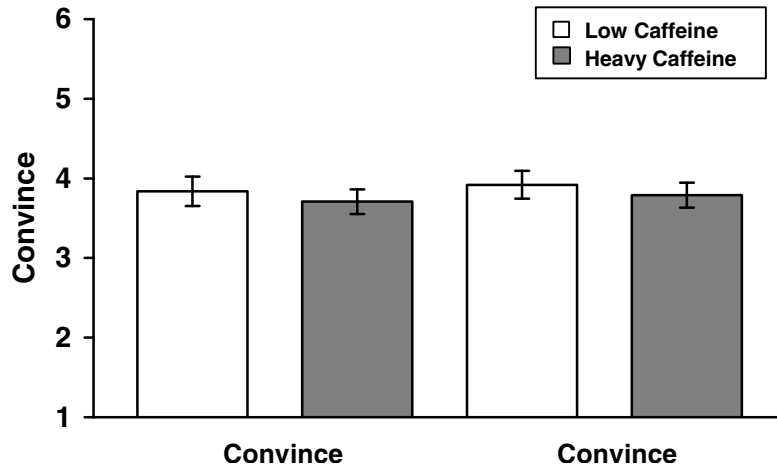
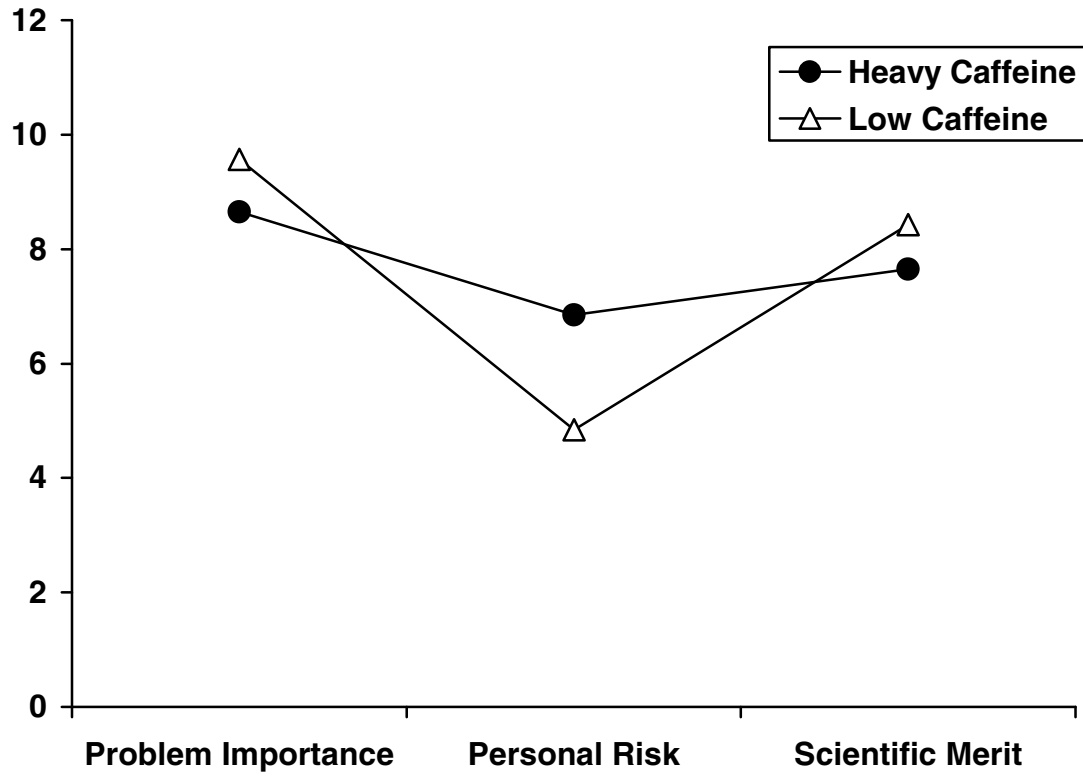


Figure 3. Convince 1 refers to how convinced women are of the link between caffeine consumption and fibrocystic disease, & convince 2 refers to how convinced women are of the link between caffeine consumption and the dangerous substance cAMP. Variables are on a scale from 1 to 6.

Figure 4. Means for heavy and low caffeine consuming women on dependent variables problem importance, personal risk, and scientific merit.



Appendix C

Informed Consent Form Measures

Informed Consent

This project is designed to understand how different college students think about caffeine use and how well students can recall information presented about caffeine use. This project is being conducted by Thad Leffingwell, Ph.D., an Assistant Professor, and Melissa Jackson, graduate student, in the Department of Psychology at Oklahoma State University. This project is approved by OSU's Institutional Review Board.

If you choose to participate, you will complete an on-line questionnaire that includes questions about your own use of caffeine, memory recall of information presented about caffeine use, and attitudes about risks associated with caffeine use. This questionnaire should take less than an hour to complete.

The risks of this study are minimal and do not exceed those ordinarily encountered in daily life.

Your individual responses to the survey will be anonymous. The information you submit will be sent to a password protected file on our server, which will only be accessible to the researchers. In addition, the IP address of the computer from which you are completing the survey is not recorded in the database. Several times each week the data will be removed from the server. Your name or any other identifying information will not be associated with any of the data you provide.

Your participation is voluntary. There is no penalty for choosing to not participate. If you are eligible for research credit in a course due to your participation, the instructor of that course will make optional comparable activities available. You may choose to not participate now, or at any time during your participation.

If you choose to participate, the primary benefit to you will be 1 hour of research credit. After completing the survey, you will be directed to a page that will ask you to submit your name, student number, and other information to allow us to make sure you are given appropriate credit for your participation.

If you have any questions or need to report an effect about the research procedures, you may contact Thad R. Leffingwell, Ph.D. at (405) 744-7494 or 215 North Murray, Stillwater, OK 74078. If you have questions about your rights as a research participant, you may take them to the Executive Secretary of OSU's Institutional Review Board at (405) 744-5700 or 415 Whitehurst, Stillwater, OK 74078.

Measures



caffeine and health study

behavior change laboratory

oklahoma state university

You must answer all questions to successfully submit the survey!

Demographic information

Gender: male female

Ethnicity:

Class:

Age:

In your opinion, *how serious* are the effects of caffeine to people's health?

Not at all Serious Very Serious

In your opinion, how *at risk* do YOU think YOU are for experiencing negative consequences associated with caffeine consumption?

Minimal Risk High Risk

How *important* do you think it is that YOU change your normal level of caffeine consumption?

Not at all Very Important

To what extent do YOU agree or disagree that there is an association between caffeine consumptions and negative consequences?

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Health Locus of Control

Instructions: Each item below is a belief statement about your health, with which you may agree or disagree. For each item, please choose the response that best represents the extent to which you agree or disagree with that statement. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

If I get sick, it is my own behavior which determines how soon I get well.

--choose one--

No matter what I do if I am going to get sick I will get sick.

--choose one--

Having regular contact with my physician is the best way for me to avoid illness.

--choose one--

Most things that affect my health happen to me by accident.

--choose one--

Whenever I don't feel well, I should consult a medically trained professional.

--choose one--

I am in control of my health.

--choose one--

My family has a lot to do with my becoming sick or staying healthy.

--choose one--

When I get sick, I am to blame.

--choose one--

Luck plays a big part in determining how soon I will recover from an illness.

--choose one--

Health professionals control my health.	<input type="text" value="--choose one--"/>
My good health is largely a matter of good fortune.	<input type="text" value="--choose one--"/>
The main thing which affects my health is what I myself do.	<input type="text" value="--choose one--"/>
If I take care of myself, I can avoid illness.	<input type="text" value="--choose one--"/>
When I recover from an illness, it's usually because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	<input type="text" value="--choose one--"/>
No matter what I do, I'm likely to get sick.	<input type="text" value="--choose one--"/>
If it's meant to be, I will stay healthy.	<input type="text" value="--choose one--"/>
If I take the right actions, I can stay healthy.	<input type="text" value="--choose one--"/>
Regarding my health, I can only do what my doctor tells me to do.	<input type="text" value="--choose one--"/>

Caffeine Consumption Questionnaire

Coffee

1. For the following questions, assume a serving is one 8 oz. cup of brewed or instant caffeinated coffee. A 'tall' is 16oz and a 'grande' is 20oz. **(do not include coffee drinks such as lattes, cappuccinos, mochas, blended/frozen coffee drinks, etc).**

A. Total, how many servings of coffee do you typically consume **per week (Monday through Friday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
--choose one--	--choose one--	--choose one--

B. Total, how many servings of coffee do you typically consume **per weekend (Saturday and Sunday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
--choose one--	--choose one--	--choose one--

C. Which type of coffee do you typically drink?

Brewed Instant Do not drink coffee

E. At what age did you start drinking coffee?

Enter "00" if never

F. At what age did you start drinking coffee regularly?

Enter "00" if never

Espresso

2. For the following questions, assume a serving is one regular-size drink containing one shot of espresso (latte, cappuccino, mocha, blended/frozen coffee drinks, etc.). If you typically get a double shot of espresso (Large drinks have a double shot), remember to count it as two drinks.

A. Total, how many servings of espresso drinks do you typically consume **per week (Monday through Friday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>

B. Total, how many servings of espresso drinks do you typically consume **per weekend (Saturday and Sunday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>

C. At what age did you start drinking espresso drinks?

Enter "00" if never

D. At what age did you start drinking espresso drinks regularly?

Enter "00" if never

Tea

3. For the following questions, assume a serving is one 8 oz cup of caffeinated (not herbal) tea. A 'tall' is 16oz and a 'grande' is 20oz.

A. Total, how many servings of tea do you typically consume **per week (Monday through Friday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
--choose one--	--choose one--	--choose one--

B. Total, how many servings of tea do you typically consume **per weekend (Saturday and Sunday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
--choose one--	--choose one--	--choose one--

C. At what age did you start drinking tea?

Enter "00" if never

D. At what age did you start drinking tea regularly?

Enter "00" if never

Energy Drinks

5. For the following questions, assume a serving is one container of an energy drink (Red Bull, 180, Jolt, caffeinated water, etc.).

A. Total, how many servings of energy drinks do you typically consume **per week (Monday through Friday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>

B. Total, how many servings of energy drinks do you typically consume **per weekend (Saturday and Sunday)**?

Morning (6 am -- noon)	Afternoon (noon -- 6 pm)	Evening (6 pm -- 2 am)
<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>	<input type="text" value="--choose one--"/>

C. Which brand do you typically drink? (Enter "00" if none)

E. At what age did you start drinking energy drinks?

 Enter "00" if never

F. At what age did you start drinking energy drinks regularly?

 Enter "00" if never

6. For the following medications, how many pills of each kind do you take in a typical **week (Sunday through Saturday)**, and at what age did you first start taking them?

	Number of pills	Age
Vivarin	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never
NoDoz	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never
Excedrin	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never
Midol	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never
Vanquish	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never
Anacin	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never
Dexatrim	<input type="text" value="--choose one--"/>	<input type="text" value="00"/> Enter "00" if never

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Read the following information carefully. You will be asked about it later.

Coffee and Women, a New Health Risk

Caffeine has long been a significant part of the American diet. Identified as the most widely used substance in this country, caffeine is found mostly in coffee. The wide use of caffeine by Americans has raised concerns about its possible health risks. Medical research conducted over the last 15 years has tried to identify what those risks might be, and discover whether certain sub populations of Americans may be more at risk than others. A widely cited article published in the *New England Journal of Medicine* (1981) found that caffeine poses little risk for men but a very serious health risk for women. The authors- Drs. James Cutting and Elliot Smith-recommended that physicians warn their female patients to avoid caffeine entirely.

The NEJM article stated that the major health risk for women who consume caffeine is fibrocystic disease. This is a disease where palpable lumps exist in the breast, usually associated with the menstrual cycle, but the disease generally becomes progressively worse. This is a serious condition, because advanced fibrocystic disease is associated with breast cancer. Alarmingly, fibrocystic disease often goes unnoticed during its early stages, because many women with palpably irregular breasts are unaware of it.

The authors of the NEJM article based their conclusions on the results of a study in which they showed that caffeine inhibited the effectiveness of esteroziamine, an enzyme which controls levels of a toxic chemical called cAMP in the breast. High levels of cAMP are apparently associated with breast disease. In fibrocystic disease, the concentration of cAMP is about 1.5 times greater than in normal breasts, and in women with breast cancer, cAMP levels are sometimes 4 to 5 times higher than normal. In a normal breast, the enzyme esteroziamine degrades cAMP. This enzyme ensures that cAMP remains at non-toxic levels. However, because caffeine inhibits the secretion of esteroziamine, cAMP rises to toxic levels.

The NEJM article's recommendation that women should eliminate caffeine from their diets was accepted by some researchers and physicians and challenged by others. More importantly, the article stimulated additional research on the issue. Despite those who challenged the conclusions of the original NEJM article, the balance of newer research findings strongly supports the caffeine-fibrocystic disease link. Women who consume moderate to high amounts of caffeine are at a much higher risk for developing fibrocystic disease than women who are not caffeine users.

In the "brief notes" section of the NEJM in August 1982, Drs. Charles Carver and Phillip Constanzo reported the results of a study which compared women with and without fibrocystic disease. 50 women between the ages 22 and 56

who were suffering from fibrocystic disease formed the researchers' "test" group. In contrast, 50 women between the ages of 17 and 36 who were seen at the same Medical Center for pregnancy-related treatment formed the "comparison" group (31 for normal deliveries, 12 for third trimester bleeding, and 7 for regular check-ups).

After examining the subjects' dietary histories, the researchers discovered that coffee drinking was much more common among women with fibrocystic disease than among women in the pregnancy comparison group. 73% of the women with fibrocystic disease reported drinking two or more cups of coffee per day compared to only 41% of the pregnant women. The researchers found that this difference was statistically significant. (Note: Researchers use the term "statistical significance" to refer to differences between study groups that, on the basis of statistical tests, are unlikely to be due merely to chance factors. The likelihood of finding significant differences between study groups increases as the number of people in the study increases. Even if real differences in fact exist, those differences might not emerge as "statistically significant" if the sample sizes studied are too small.)

Another study confirming the caffeine-fibrocystic disease relationship was reported by the authors of the original 1982 NEJM article. At the 1983 American Medical Association meetings, Drs. Cutting and Smith reported that they had confirmed original results using an entirely new sample of subjects. 30 women participated in the 2-week study in which half were instructed to drink 5 cups of regular (i.e., caffeinated) coffee per day and a half were instructed to refrain from drinking coffee altogether. Initially as well as two weeks later, the researchers measured the levels of esteroziamine and cAMP in the women's breast tissue. Also, the women received a breast examination by a physician who "graded" their breast tissue for its degree of granularity, or lumpiness. The chemical results were just as predicted. Among the women who refrained from coffee drinking, both esteroziamine and cAMP levels remained steady over the two week study period. However, for the women drinking 5 cups of caffeinated coffee every day, esteroziamine levels decreased while cAMP levels increased, a result supporting the researchers' theory the caffeine lets cAMP rise to dangerous levels because caffeine inhibits the secretion of esteroziamine. On the physician's rating of breast granularity, it was expected that the coffee group would have more granular breasts than the non-coffee control group. But the two groups didn't differ on this score.

Drs. Cutting and Smith noted that this non-finding could reflect measurement error-that the physician's rating were simply too gross to detect subtle differences between the two groups. With better detection devices, such as mammogram technique, a stronger association between caffeine consumption and breast granularity would probably be found. (Note: A mammogram is an X-ray like photograph that is taken of the breast. The American Cancer Society recommends

that all women over 40 with a history of breast cancer in their family have a yearly mammogram).

In the biggest study to date, Dr. Barry Jacobs and his colleagues studied the hospital records of over 3,000 women. From the record, 3 comparison groups were formed: 200 women who had breast cancer, 200 who had fibrocystic disease (but no evidence of breast cancer), and 200 women who had cancer at a site other than the breast (e.g., lung cancer, stomach cancer, ovarian cancer). In examining subjects' dietary histories, the 3 groups of women were compared both in terms of their caffeine usage and other habits that might predict health status (e.g., smoking). The results showed that the breast cancer patients drank an average of 4.6 cups a day (in a "typical week"), the fibrocystic disease patients reported at average of 4.3 cups a day, and the control group of women with cancer at other body sites reported drinking an average of only 3.0 cups a day! Although the 2 breast disease groups did not differ "significantly" according to the researchers, both were "significantly" higher than the control group of women. An intriguing finding was also obtained when the researchers compared their groups on other dietary measures. On most of the measures 3 groups were indistinguishable. However, both the breast cancer and fibrocystic disease groups reported eating "significantly" more red meat than did the women who had cancer at the body sites. Together with other research on breast cancer (see July, 1985 issue of the newsletter), the results of this study would seem to imply that, in addition to caffeine, red meat consumption may also have contributed to the greater prevalence of breast disease among women in the fibrocystic disease groups.

Of course, not every study since 1981 has been able to show a strong link between caffeine and fibrocystic disease. At the 1986 convention of the American Coffee Brewers Association, Drs. Kenneth and Barbara Wallston reported data from their 10-year longitudinal study of 45 women, all of whom were free of fibrocystic disease when they started the study. During the next 10 years, the women were contacted periodically to complete a questionnaire measuring their dietary and health habits. In the study's 10th year, the women were given a medical exam to discover who, if any, had developed breast problems. The results of the study would seem to be somewhat inconclusive because only 30 of the women could be reached at the 10-year follow-up. (According to the researchers, 1 woman had been moved away and 4 others had dropped out for other reasons.) Of the 30 women seen at the follow-up, 7 of them had indeed developed fibrocystic disease. In addition, those 7 women did seem to be heavier coffee drinkers than the 23 women who had not contracted the disease, but the differences between the two groups (an average of 5.2 cups of coffee a day for the 7 fibrocystic disease women vs. an average of 2.6 cups for the 23 non-diseased women) were not statistically significant. While cautioning that their final sample sizes were somewhat small, the researchers nevertheless concluded at the Coffee Brewers Association convention that the "caffeine-fibrocystic disease link, if it existed at all, is trivial in size."

As the Wallstons' research demonstrates, not every study on caffeine and breast disease and women has concluded that there is a connection. Nevertheless, the majority of recent research studies strongly indicate that there is ample scientific basis for asserting that a link between caffeine intake and fibrocystic disease exists. Although more research remains to be done, the conclusion of the original NEJM article and its message for American women seem even clearer when more recent research is taken into account. Thus, the original recommendation that women should eliminate caffeine from their diets appears particularly warranted.

Post-Experimental Questions

The following questions are based on the information you just read regarding the link between caffeine consumption and fibrocycstic disease. Please answer the following questions by choosing the answer the best reflects your opinions. There are no right or wrong answers.

Had you heard of fibrocycstic disease prior to this study?

--choose one--

To what extent do YOU agree or disagree that there *is an association between caffeine consumption and fibrocycstic disease* cited in the article you read?

--choose one--

What do you remember concerning the link between caffeine consumption and fibrocycstic disease as reported in the article?

How *important* do YOU think it is that women reduce their caffeine consumption in order to avoid these consequences?

Not at all Important Very Important

In YOUR opinion, *how serious* are the effects of caffeine to women's health?

Not at all Serious Very Serious

How *at risk* do YOU think YOU are for developing fibrocystic disease within the next 15 years?

Minimal Risk High Risk

How much do YOU feel personally threatened by the information about the consequences of caffeine consumption?

Not at all Threatened Very Threatened

How would YOU rate the *scientific merit* of the study findings cited in the article above?

Very Unscientific Very Scientific

How confident are YOU that a link between caffeine consumption and fibrocystic disease has been *scientifically proven*?

Not at all Confident Extremely Confident

How convinced are you of the connection between caffeine consumption and fibrocystic disease?

Not at all Convinced Extremely Convinced

How convinced are you of the connection between caffeine consumption and the dangerous substance cAMP?

Not at all Convinced Extremely Convinced

Please indicate YOUR own level of caffeine consumption:

- Heavy Use
- Moderate Use
- Low Use
- No Consumption

IMPORTANT!! The following questions will NOT effect your credit for participating in any way. Please answer honestly.

Did you actually read the article you were asked to read earlier? (It is OK to say "No", and important that you do so if it is true)

--choose one--

How much attention did you devote to your participation in this study?

--choose one--

Yay! You're finished!

Click the "Submit" button below to submit your answers. **Do NOT click the "Submit" button more than once.**



caffeine and health study

behavior change laboratory

oklahoma state university

Step 3. Get the credit you deserve!

Read the debriefing statement, and then complete and submit the information below. We will submit the information to Experimetrix to make sure you receive research credit for your participation. You will receive one credit for participation. This data is kept separate from your survey data, which was anonymous.

PLEASE READ:

The true purpose of this study was to determine how expectancy beliefs about one's health influence the acceptance of potentially threatening information (i.e., negative consequences of caffeine use). All participants were asked to provide information related to personal life events, read information regarding the negative consequences of caffeine, and provide feedback about drinking caffeine. The article regarding the negative effects of caffeine use was adopted from a medical journal. However, the link between caffeine consumption and fibrocystic disease has been disputed, according to the National Institute of Health (NIH): "The cause of fibrocystic disease is not completely understood, but the changes are believed to be associated with ovarian hormones since the condition usually subsides with menopause, and may vary in consistency during the menstrual cycle. The risk factors may include family history and diet (such as excessive dietary fat, and caffeine intake), although these are controversial."

Memory was not assessed during this study; the purpose of the recall task was to determine if you read and understood the article. Explaining the purpose of the study ahead of time may have resulted in biased answers. Therefore, it was necessary to hide the true purpose of the study. We apologize for needing to deceive you. Feel free to contact us if you have any further questions at: mo.jackson@okstate.edu

Thank you!

Your submission has been accepted

You may want to print this page for your records to confirm your participation in this study.

IMPORTANT: We will assign credit to your account in Experimetrix, but you must log in to assign that credit to a course! We cannot do that for you.

IRB Approval Form

Oklahoma State University Institutional Review Board

Date: Thursday, February 23, 2006
IRB Application No AS0666
Proposal Title: Defensive Bias and Health Locus of Control

Reviewed and Processed as: Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 2/22/2007

Principal Investigator(s)

Melissa Jackson
215 North Murray
Stillwater, OK 74078

Thad Leffingwell
215 N. Murray
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,



Sue C. Jacobs, Chair
Institutional Review Board

VITA

Melissa Randi Jackson

Candidate for the Degree of

Master of Science

Thesis: HEALTH LOCUS OF CONTROL AND DEFENSIVE BIAS

Major Field: Clinical Psychology

Biographical:

Education: Graduated with a Bachelor of Arts in Psychology from the University of Wyoming, Laramie, Wyoming in May 2004. Completed the requirements for the Master of Science degree with a major of Clinical Psychology at Oklahoma State University, Stillwater, Oklahoma in May 2006.

Experience: Clinical experience includes Oklahoma State University Psychological Services Center; employed by Oklahoma State University, Psychology Diversified Students Program from 2004 to 2005; employed by Oklahoma State University Department of Psychology as a graduate teaching assistant and by Dr. Thad Leffingwell as a research assistant, 2005 to present.

Professional Memberships: Association for Behavioral and Cognitive Therapies, Oklahoma Psychological Society, and Society for the Advancement in Chicano and Native American in Science.

Name: Melissa Randi Jackson

Date of Degree: May, 2006

Institution: Oklahoma State University

Location: Stillwater, Oklahoma

Title of Study: HEALTH LOCUS OF CONTROL AND DEFENSIVE
BIAS

Pages in Study: 103

Candidate for the Degree of Master of Science

Major Field: Clinical Psychology

Scope and Method of Study: Research has continually shown that when individuals receive threatening health messages that contain personally relevant information, they show a greater tendency to be critical than if the message contained favorable information. The purpose of the study was to determine if presenting high and low threat messages regarding an unfamiliar fictitious disorder would affect defensive processing, using an internet-based approach. Another purpose of the study was to determine if individuals' perceived control over changing behaviors that lead to negative health conditions, or health locus of control, poses as a moderating variable in processing threatening health messages. All participants were college students, at least 18 years of age, who engaged in research for course credit. Each participant completed questions regarding personal caffeine consumption and health locus of control. They were then asked to read an article linking caffeine consumption to fibrocystic disease, which is related to breast cancer, and then answer questions designed to capture beliefs and attitudes regarding the effects of caffeine on health.

Findings and Conclusions: The presentation of a threatening health message was not shown to affect defensive processing in this study. Participants most threatened by the message, or heavy caffeine consuming women, did not engage in more defensive processing than participants least threatened by the message, or low caffeine consuming women and all men. In addition, despite the amount of caffeine consumption reported, health locus of control was not related to the tendency to engage in defensive processing.

ADVISER'S APPROVAL: Thad R. Leffingwell, Ph.D.